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Honorable Mention, 1914

MILITARY PREPAREDNESS[1]

By Naval Constructor Richard D. Gatewood, U. S. Navy

Motto: Given to strong delusion, wholly believing a lie,
Ye saw that the land lay fenceless, and ye let the months go by
Waiting some easy wonder: hoping some saving sign—

Military preparedness and the direction of arms are difficult enough in every country but nowhere in the world are they more difficult than in the United States. Our geographical position and freedom from entangling alliances have placed us in a position of such "splendid isolation" that the masses of this peace-loving and peace-professing nation refuse to realize the necessity for preparedness or the vastness of the effort entailed in waging war.

The spirit dominating our republic has not listened to so far-sighted a policy as organized preparation for definite military tasks, and has been guided by *prestige* rather than by sound reasoning. Then, too, we have not been at war with a power of the first-rate for over a century; and having never known unsuccessful war, industrialism and internal affairs have occupied

[1] Author's Note.—The writer wishes to acknowledge here his indebtedness to Commander F. H. Schofield, U. S. N., to Commander C. T. Vogelgesang, U. S. N., and to Pay Inspector S. McGowan, U. S. N., for their many valuable suggestions and for their frank and painstaking criticism of this paper while in process of preparation. The war plan is very largely the work of Commander Schofield.

our days and thrown up about us iron walls of indifference against which the teachings of history have hammered almost in vain.

Nevertheless other nations and the majority of thinking men of our own country have so far been unable to explain away the part that physical force must necessarily play in any political community. They are not yet prepared to believe that all questions of race and religion, honor and pride can be settled either by arbitration or by conference between certain bankers holding the purse-strings of the world.

They see that for all the red-blooded nations of the earth just as for individuals life is a search after power; that in this search comes a time when each nation must take its stand among the others and, whether through force of circumstance or of its own volition, must give answer to certain fundamental questions affecting its welfare and comfort, and indeed its very existence. The answers thus given are called its policies.

These are not mere lifeless idols never changing with the progress of the years; but rather the living embodiments of the will of a people, changing like other living things with new conditions. We ourselves are positively bristling with a set of policies that give us contact with many other states along virtual frontiers approached in extent by those of England alone. To put into effect the Monroe Doctrine, the Open Door in the Far East, Asiatic exclusion, and the control and protection of the Panama Canal, and to maintain them against the clashing ambitions of other nations in their search for life-power there is necessary a certain force. War is simply the most potent instrumentality of this force that man in his progress from the predatory to the polite has yet devised.

In this age it is fundamental that before beginning a war there must be a clearly defined objective, toward the attainment of which all plans and efforts must be aimed. (With Spain, for example, our object was not to conquer Spain but to change her status in Cuba. The Japanese had no intention of forcing Russia from Siberia; they wanted merely to change her Far Eastern status and gain for themselves a foothold on the Liaotung peninsula.) Behind this objective must be the whole people, for war has long since ceased to be an affair between sovereigns and statesmen. It has become one of *nations*—bitter, merciless and crushing.

Failure to plan and prepare for the use of military force to attain a national objective has sometimes caused the nation to pay the price with her very life's-blood. Always the pity of it is that she should have to pay in so many ways and so many times for a single fault, but, in her account with fallen states, Destiny never closes her books.

Intelligent preparation must embrace a complete survey of all our own forces, finances and resources, and those of the enemy as well. Departments and bureaus, armies and fleets, and guns, and torpedoes, and personnel are all but parts, as indeed are all questions of "Morale," "Principles of Command," or even "The Proper Organization and Administration of the National Fleet for the Conduct of a Great Campaign."

It may be inquired whether these problems are not each being solved at least in part by different men; but the answer is "No, not all." And sad to relate an even more unqualified negative must be the answer to the broader question:

"Are we prepared for war?"

If one unacquainted with mechanics chances to be on board a battleship in the midst of target practice his first impression is probably one of surprise that any hits can result from the apparent confusion he sees before him. Gradually, however, he comes to understand that the rate at which each wheel turns is regulated to a nicety, that the pistons cannot give a stroke by one hair's-breadth shorter or longer than intended, that the force of the powder behind the shell is capable of the most accurate adjustment, that checks and counter-checks exist as a sufficient guarantee against accident, and that in general each portion of the machinery is adapted to perform a certain specified bit of work and is under such perfect control that it cannot interfere with the functions of any other part. He will then no longer be surprised that with proper care of the matériel and training of the personnel the target is literally shot to pieces at 10,000 yards.

If, on the other hand, he finds after examination that the confusion is even worse than at first sight appeared, that the movement of each wheel is eccentric to a high degree, that the pistons are liable to stop, that no one has previously calculated the strength of the powder, that safety valves are wanting, that the work to be performed by each separate portion is uncertain and variable, that a strong centrifugal force is constantly at work

impelling the different parts of the machinery to fly from their orbits, he will then no longer look for holes in the target. Indeed he will be surprised that the mechanical chaos before him should admit of any hits at all.

The present condition as to military preparedness of our country bears to the ideal condition almost exactly the same relation that the second battleship described above bears to the first.

Strong men are striving to perfect administration and organization. Progress is undoubtedly being made, but there is no common concrete objective, no point of concentration for all these earnest efforts. In a word, *we have no war plans!*

"A war plan?" you say, "What *is* a war plan? I have never heard of one. Surely someone somewhere has laid out a plan of action in the event of war, or if they have not, some such scheme could readily be devised from the mass of data on hand." The pity of it is that you are partly right. Such a plan *has* been made —*on paper!* But, although the most important single contribution to the science of war in this country, it has seen but little of the light of day. Its mere existence is not known to those in the highest quarters.

THE LIMITATIONS OF THE STATESMAN

War of to-day cannot be improvised and can be successfully waged only after the most intensive preparation and planning. It can be entered into by an act of government only, and its higher direction therefore lies in the hands of statesmen. No single art of empire requires more unremitting labor and more diligent apprenticeship. The statesman who might conceivably fill the place of a War Lord should have an intimate personal knowledge of his own country and of her territories, their resources and their needs. He should have personal experience in the business of administration. He must keep in touch with foreign countries and know the motives of their rulers and their people and he must know the numerical and actual military strength of all important states in the world, their resources and the relative effects of their possible combinations.

Having acquired this he must still learn the art of directing the other two great forces under his control, the army and the navy. The lessons of history will guide him, his knowledge of

existing conditions will help him, and both must be applied in accordance with the most advanced practice of the day.

When he knew all this he would still have to be in a position of absolute authority from which to issue the necessary orders to carry it into effect, and the form of our government is such that there *is* no place provided for this prodigy. We have made no provision for a Napoleon, or an elder Pitt; and, if we had, long before he had proved his kingship to ability, we would most probably have crucified him on the cross of our misunderstanding. Common laws and common authority were not made for men such as these.

THE LIMITATIONS OF THE MILITARY

In our country the question of peace or war is fixed by the Constitution in the hands of Congress, exactly where it belongs. The functions of the military man are supposed to be confined, in the first place, to advising on the purely military phases of the issues involved, and, in the second place, to putting into effect the decisions of the government. This is now the theory of all civilized governments. With us the line between the statesman and the general has always remained distinct and well understood, at least until the war had ceased. Then, but not until then, our people have so idealized the character of their military leaders whose actions had excited their sympathy or admiration that they have often elevated them to the chair of the presidency. Indeed so frequently have they done this that our democracy seems to develop rather than discourage hero-worship.

In foreign countries they have not always waited until hostilities were over, and the practice has differed from the theory. The soldier who is generally prone to advocate vigorous action is inclined to abrogate some of the powers of the statesman; the former is often masterful and the latter sometimes weak, too easily dazzled by the glitter of gold lace, or too readily lured beyond his depth by the siren song of some strategist to acquire a numerous set of what, in technical language, are called "keys" to some position. When this happens, there is a tendency for the military element, itself perhaps unconsciously influenced by a laudable desire for personal distinction, to dictate the policy of the nation without taking a sufficiently comprehensive view of national considerations. Cases of this kind abroad are numerous.

Earl Cromer, England's Governor-General of Egypt for many years and one of the foremost statesmen of our day, says:

> My own experience in such matters leads me to the conclusion that in most semi-military, semi-political affairs, there is generally an early stage when the statesman, if he chooses to do so, can exercise complete and effective control over the action of the soldier, but that when once that control has been even slightly relaxed, it cannot be regained until, by the course of subsequent events, some fresh development occurs bringing with it a favorable opportunity for the re-assertion of civil and political authority.

The dual role of the military man of this nation, first as the military adviser for statecraft, and second as the chosen instrument to put into execution the vast forces of war when once declared, comprises a career amply large enough to satisfy the cravings of the most exalted ambition. In either role the knowledge of human affairs and of human nature, the grasp of technical military matters, the mastery of that maze of principles and variables included under the names of strategy and tactics, the preparation of long-considered plans based on these that will enable him to do the work assigned by statecraft—surely the unstinted labor of a lifetime is not too long for the acquirement and assimilation of this knowledge. There is no royal road to the place of a commander-in-chief and few have ever been foolish enough to even think so.

THE COUNCIL OF NATIONAL DEFENCE

Both the scope of the problems involved and the nature of our government thus render it impossible for us ever to have a single man who shall direct at once our diplomacy and our arms. In default then of the man we must substitute a set of men, or a system, since no single department of government, even with the most expert advisers in the world, should be permitted to plan for or to conduct war on its own account. The first step toward establishing such a system is now being considered by Congress in the bill providing for a council of national defence. The council is to consist in effect of the Cabinet and the Congress, strengthened by expert military advisers. It is primarily responsible for the preparation of adequate forces in both branches of the service to insure the protection necessary to maintain in effect the national policies.

Heretofore the army and the navy have asked for their separate increases, each with its own ends in view, and with but scant consideration for the aims of each other. Not only has there been no strong silver thread of diplomatic and military purpose running through the fabric of our military policy, but it can be said without fear of contradiction that we have had no fabric through which it could run. The bill is admirably drawn to correct these faults. Section two provides:

> That said council shall determine a general policy of national defence and shall recommend to the President for transmission to Congress such measures relating to the national defence as it shall deem necessary and expedient.

Thus it first determines a national military policy continuous in its action, and then recommends the provision of forces adequate for the purpose.

The broad and general recommendations of this body must form the basis of any real military preparedness. It has however neither executive nor administrative authority, but is essentially advisory. Unless we fully understand the significance of this and provide against it by accurately defining it in the law we will build for ourselves an Aulic Council.[3] Again the bill seems to adequately cover this essential. Section two continues:

> Provided, that *in time of war* said council shall meet *only* upon the request of the President of the United States.

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[3] In 1804 this Council in Vienna, composed of many statesmen and senior Austrian generals, dominated all military affairs even to the extent of dictating details to the commander-in-chief in the field, the Archduke Charles. The memoirs of this great general, second in Europe at that time only to Napoleon, show how intimately he knew the needs of his army, and with what care and thoroughness with only opposition from the Council he was proceeding to meet them. All this he carefully explained to the King and the Council, asking for at least two years of preparation before declaring war against France. The Council removed him and the following year the Austrian Army was shattered at Ulm and at Austerlitz. He was again given the command but the Council continued to practically command the army, and in 1808 he again protested against a new conflict with France. This time he retained the command and inflicted on Napoleon at Aspern his first decisive defeat. Harassed and heckled at every move by the Council he conducted his masterly retreat from Wagram, and then gave up the command. Here was perhaps the one man in Europe who could have stayed the conqueror of Austerlitz. We must have no Aulic Council!

And section three adds:

That said council shall meet at least once in each calendar year on such date or dates as it shall fix: Provided, that special meetings may be called by the president of the council *except in time of war.*

THE JOINT PLAN-MAKING BODY

The next step is that from the broad national character of the preparation thus provided down to the more detailed and particular preparation for actual war. For this purpose there should be a joint plan-making body composed of military men representing the two great services.

The clear need of such a co-ordinating body has been plainly felt and freely admitted by every one of our war presidents. Its absolute necessity is further manifested by the convincing logic of actual events, for in all our wars some such council has been literally thrown together, precipitately and instinctively, to fill the breach that in a war of the first magnitude will certainly be the most fruitful cause of disaster.

Already other nations have provided such a body and from the hand of responsible officers in our own service come such recent evidences of our need as these:

Some power has to decide as to which shall receive recognition when interests conflict in war. Each interest seems of supreme importance in its own eye and only the eye that sees all interests and can focus itself to see the result of each military move in the game of major strategy should be consulted when rival claims present themselves. The command of either of two seas may offer advantages; two lines of communication may be available when only one can be held; the security of one thing may be secured by the loss of another; a backward step may have to be taken that two forward steps may result. Some power must decide, and, other things being equal, that power will give the better decision that has fortified itself with long study and deliberation, with careful weighing of military factors and with training to give decisions promptly and fearlessly. . . . . Some directing power is necessary, that the burdens of the user of the great war instrument be lightened as far as may be by planning general features in anticipation, by indicating where the releasing of energy will return the largest national reward and by considering and weighing in advance the many factors that enter into war. Whether this directing power be called general staff, general board, strategy board or division of operation of the fleet, is of no concern so long as it properly directs, for certain it is that the perfect instrument, the skilled user and the ***prepared directing power*** are alike necessary if naval efficiency is to be rewarded with that which is indispensable in war—command of the necessary sea.

And again

> . . . . how much better it would be to have a number of officers *previously* trained by study of other wars, by strategical and tactical games and by constant thought inspired by these on the various problems presented, to be able to answer the questions as they arise.
>
> The best personnel in the world, the most accurate marksmanship, the finest vessels, and the country, may all be sacrificed by a failure to grasp the possibilities brought about by the information that an enemy fleet has sailed from a given port bound in a given direction.
>
> Those who have previously studied such a problem will at once be able to say, with authority, "He is bound there, or here, or there, and we must do this, or that, or this!" Others may guess right, but the stake is too high to be won (or lost) by guesswork.

It were tedious to quote further upon this general principle with which all military minds agree, but it is pertinent to observe that these careful writers speak only from the point of view of the navy. How much more necessary then is such a co-ordinating body when we consider also the army and the intricate and complicated questions that arise in the case of *joint* operations.

The present so-called joint board is quite inadequate, chiefly because its members have so many other duties than the single one of preparing plans for war which should occupy the *entire* time of all members of the joint plan-making body. Also the State Department now has no representative on this board as it should have on account of the large amount of data that will be required from that department. Only military men should be voting members however, and they should be in the closest possible touch and intercourse with the practical activity of the forces in their areas, men who have had all the experience at sea and in the field that it is possible to give them. Otherwise the body would become merely,

> a military chancery in which men learned desk work and where they would in time lose all touch of the realities of war.

It is of the utmost importance to specify clearly and accurately the duties, responsibilities and prerogatives of this joint plan-making body. To establish it without at the same time *strictly defining* its scope would be to invite the very irresponsibility from which we are now suffering. It should be clearly stated that, while combining power and knowledge from which emanate initiative in war, it has executive authority only through the President. If he approved of its decisions his orders would be issued

in accordance with its advice and be obeyed without question by any department of the government, whereby a centralized control of events would be absolutely, uninterruptedly, and efficiently maintained.

It is in no sense an administrative body. Unless administration is kept distinctly a separate feature the whole purpose will be both misunderstood and defeated. The administrative field must be thoroughly covered as at present by the secretaries and bureau chiefs each in his respective area. Therefore it should not interfere with the administration of the army or navy or with the details of the operations of armies or fleets, and above all it should not attempt to diminish by one iota the initiative and independence of leaders but should leave to commanders unfettered liberty of action within the limits of their particular missions and to departments the express duty of supporting these commanders with all the resources at their disposal.

SINGLENESS OF RESPONSIBILITY

In the arbitrament of arms the fundamental requisite of efficient military organization is singleness of responsibility and hence of control. One need not be very far-sighted to prophesy that we will eventually have a *single executive head* responsible to each secretary for all matters relative to preparedness for war and to the proper conduct of war. This responsibility cannot and must not be any longer divided, for where there is division of responsibility the invariable result in a military sense is that there is, in effect, *no responsibility*. For the present it is sufficient to say that there is no single act of a civilian secretary so pregnant in its consequences as the choice of a commander-in-chief. It may be stated with the force of a military axiom that regardless of authority, the best general only should be placed in charge of the army, the best admiral only should be placed in charge of the navy, and both should be appointed in time of peace to serve during war. Napoleon declares, "A la guerre, les hommes ne sont rien, c'est un homme qui est tout."

Having chosen our supreme commander, it is again essential to give him the widest latitude within the limits of his clearly defined mission; he must be left to the untrammeled execution of his orders, the details and method of this execution to rest completely and absolutely with his genius. To fail in this is not

only to reflect small confidence in the ability and discretion of the man but in the patriotism of the entire force under his command.

How well was this understood by the elder Pitt, and how unlimited were the possibilities had the sun of his power shone a half century later in the days of Nelson. "The King," wrote Pitt on one occasion, "judges it highly prejudicial to the good of his service to give particular orders and directions with regard to possible contingent cases that may arise." Conceive for yourself the feelings inspired in an admiral who received from him orders beginning with such a personal touch, such a reliance on his loyalty and ability as, "His Majesty trusts to your well-known zeal and activity," or "anticipates action of the utmost vigor." Is there a better example of order writing and trust in a commander-in-chief than his order to Amherst: "It is his majesty's pleasure that you do attempt an invasion of Canada by way of Crown Point or La Galette, or both, according as you shall judge practicable, and proceed if practicable to attack Montreal or Quebec, or both of such places successively with such of the forces as shall remain under your immediate direction, in one body, or by a division of the said forces into separate and distinct operations, according as you shall from your knowledge of the countries through which the war is to be carried or from emergent circumstances, not to be known here, judge all or any of such attempts to be practicable."

THE WAR PLAN

The need for a joint plan-making body being both logical and imperative, what, in detail, should be its precise work? None of the great authorities on military subjects have ever ventured to answer this in writing. Approached as to the details of filling the lack they have been so unanimous in decrying they remind one of a certain Mr. Rogers.

"Of what religion are you, Mr. Rogers?" said a lady once.

"What religion, madam? I am of the religion of all sensible men."

"And what is that?" she asked.

"All sensible men, madam, keep that to themselves."

They generalize, and well they might when once they attempt a detailed analysis of what it means to be responsible for success in war; and yet, it is this ignorance of just what is to be done

that has given us pause. The same students of war and statesmanship that have been most tireless in their efforts to bring into being a war staff have none of them hitherto *provided it with an instrument to its hand,* and in this lies perhaps the most potent cause of their failure. No higher incentive toward military preparedness and no more convincing argument toward the need for such a staff could be devised than a well-conceived comprehensive plan showing its functions and its relations to the administrative branches of the government. The mere fact of the existence of a real plan in a highly perfected form would not only immeasurably increase our own confidence in our forces, but would immediately induce a far greater respect for those forces on the part of foreign nations. Outward and visible signs of readiness and efficiency of military forces furnish diplomacy its strongest argument, and peace its surest advocate.

Physical force has no value where there is nothing else and it is plain that even with a war staff the individual knowledge and ability of its members is of little use unless we can have it when we want it, concentrated and capable of direction. To do this, we must first overcome the "initial friction" and the "working-load friction" of the war machine. These are so great that the time thus spent may settle the whole character of the war and its result. Time in war is more important than guns and men, and the rate of living of the world to-day is exceeded only by its rate of making war.

We must continually remind ourselves that the way of the "old navy" is not our way. The old doctrine that, given a national determination to fight and to win, the material energies will sooner or later find their way into the right channel drops naturally into the category of things unfortunate if true. *Sooner* or later, that is the point.

In order then to overcome in a minimum of time the resistances of the medium and material in which we are working and to insure the concentration necessary to direct all our efforts toward a single concrete objective, a plan is necessary which will comprehend:

First, a careful analysis to determine exactly what is to be accomplished before anything is undertaken.

Second, the determination of the best way to accomplish the project in the quickest time, and,

STUDIES OF POLICY

ENEMY POLICY

(a) A full exposition of the enemy policy in question. How valuable is that policy to the enemy? How injurious is that policy to us? What is the attitude of other nations towards enemy policy? How strong is the support accorded the enemy policy by the enemy people?
(b) A statement of other enemy policies that might be involved if war came; their relations to the war.
(c) A statement of redress or compensation the enemy will probably demand in case of victory.
(d) Do the demands of enemy policy impose upon him a geographical objective?
(e) A statement of the attitude of the various powers toward the enemy. Will their attitudes impose upon him any military restraint not comprehended in international law?
(f) A statement of the temper of the enemy people.

By STATE DEPARTMENT.

INTERNATIONAL LAW

(a) Treaties regarding the conduct of war that have been entered into with the enemy.
(b) Conventions bearing on the conduct of war that have received the ratification of both powers.
(c) Treaties in force granting special privileges in possible theaters of war.
(d) Questions of neutrality likely to be raised and how far we may count on liberal interpretations of international law in the theater of operations.
(e) The bearing of the present practice of international law on our interests.
(f) A series of typical situations likely to arise in the proposed war and their solution according to existing international law.

By STATE DEP'T AND SPECIAL ADVISERS.

OUR POLICY

(a) A full exposition of our policy
tion. How valuable is it to us? Ho
rious is it to the enemy? What is the
of other nations towards this policy
strongly is it supported by the people
(b) A statement of other of our
that might be involved if war came.
(c) A statement of redress or compe
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(d) Do the demands of our policy
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(f) A statement of the temper of the

By STATE DEPARTMENT.

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NAVAL ESTIMATE OF THE SITUATION

This estimate of the situation is a solution under the conditions tabulated of the war problem which the instructions of supreme autho

GENERAL MISSION

A statement of the task assigned the navy by supreme authority. Here follows a study of the conditions from which is det

FIRST MISSION

A statement of the initial task of the navy. The first mission is that part of the general mission, the accomplishment of which can be planned with re
as detached from the general mission, except for the purpose of limiting arrangements to conditions that can be fore

ENEMY FORCES

A complete analytical examination of the naval situation from the enemy point of view and the deduction therefrom of his prob

OUR OWN FORCES

A complete analytical examination of our naval situation having constantly in view our naval mission and the enemy's probable intentions and the dedu
open to us. A comparison of these courses of action and the determination of the course of action to adopt.

NAVAL DECISION

The naval decision comprehends the strategic plan of naval operations. It covers the following points: (a) Character of naval war to be undertaken
and places for strategic deployment. (d) Direction of subsequent effort. (e) Strategic objectives. (f) Manner of co-operation with th
(a) Strategic studies of possible phases of the war. (b) Tactical studies of localities.

By NAVAL PLAN MAKING BODY.

PLAN OF ORGANIZATION FOR WAR

This plan shows:
(a) The flow of authority in all its ramifications.
(b) The administrative grouping of the forces.
(c) The tactical grouping of the forces.
(d) The personnel of command.
(e) The staff personnel of chief command.
(f) Orders necessary for execution of plan.

PLAN OF MOBILIZATION FOR WAR

This plan must show:
(a) The vessels to be mobilized.
(b) The composition and sources of their crews.
(c) The names of their chief officers.
(d) The dates when mobilization must be completed.
(e) The place of assembly.
(f) Plan of recruiting organization.
(g) Orders necessary for execution of plan.

LOGISTIC PLAN FOR WAR

This plan must show:
(a) The initial requirements as to supplies of all kinds.
(b) The probable requirements for subsequent phases of the war.
(c) The sources of supply, and supplies available.
(d) The organization of the transportation.
(e) The organization of the naval train.
(f) A list of available vessels, their characteristics, whereabouts, and places of assembly and alteration, and period

TENTATIVE PLAN OF A WAR PORTFOLIO

STUDIES OF ENEMY FORCES

ARMY	NAVY	RESOURCES
(a) Statement of forces in readiness and their present distribution. (b) Statement of time necessary to deploy forces in readiness in various theaters. (c) Statement of forces in reserve and their present distribution. (d) Statement of time necessary to mobilize forces in reserve. (e) Statement of time necessary to deploy reserve forces in various theaters. (f) Statement of efficiency, and morale of forces in readiness. (g) Statement of efficiency and morale of reserve forces. (h) Statement of abilities of available commanders. (i) Statement of peace organization of forces. (j) Statement of changes necessary to pass to a war organization and a full exposition of the friction entailed. (k) Statement of transports and supply vessels necessary to a stragetic deployment in each area. (l) Statement of transports and supply vessels in service. (m) Comprehensive studies of each possible theater of operations both from an offensive and a defensive standpoint. Military geography. Sanitary conditions. Statistical information upon the resources of all kinds which the various theaters of operations afford. Fortifications and field works. (n) Comprehensive studies of lines of communication and operation to possible theaters of operations. Location of principal bases. Transportation facilities.	(a) Statement of forces in readiness and their present distribution. (b) Statement of time necessary for forces now ready to reach various theaters. (c) Statement of forces in reserve and their present distribution. (d) Statement of time necessary to mobilize forces in reserve. (e) Statement of time necessary for reserve forces to reach various theaters in readiness. (f) Statement of efficiency and morale of forces in readiness. (g) Statement of efficiency and morale of reserve forces. (h) Statement of abilities of available commanders. (i) Statement of peace organization. (j) Statement of changes necessary to pass to a war organization, and a full exposition of the friction entailed. (k) Statement of colliers, auxiliary and supply vessels that will be necessary to support the forces employed in various theaters. (l) Comprehensive studies of various theaters of operations: Anchorages, temporary bases, supplies, climate, prevailing winds, communications, sources of supply, fortified bases.	(a) Statement of funds. (b) Statement of credit. (c) Statement of merchant vessels available. (d) Statement of accumulated military stores and their location. (e) Statement of reserve arms and ammunition. (f) Statement of producing capacity for military stores, guns and ammunition. (g) Statement of land transportation capacities. (h) Statement of what may be obtained by importation. (i) Statement of capacity for road and railroad construction and equipment. (j) Statement of maintenance, repair and building facilities. (k) Statement of probable or possible allies and the support they would afford.
By Military Information Division.	By Naval Intelligence.	By Joint Plan Making Body.

GRAND ESTIMATE OF THE SITUATION

This estimate of the situation is the solution, under the conditions tabulated, of the war problem resulting from the conflict of the policies outlined.

MISSION

A statement of what it has been determined to accomplish by the war.

ENEMY FORCES

A complete analytical examination of the general situation from the enemy point of view and the deduction therefrom of his probable intentions.

OUR OWN FORCES

complete analytical examination of our situation, having constantly in view our mission and the enemy's probable intentions, and the deduction therefrom of the courses of actio
A comparison of these courses of action, and the determination of the course of action to adopt.

GRAND DECISION

e grand decision comprehends the strategic plan of the war. It covers the following points: (a) Character of the war to be undertaken. (b) Time of beginning the war. (c)
employed. (d) Times and place for strategic deployments. (e) Direction of subsequent effort. (f) Strategic objectives. (g) Nature and extent of co-operation betwe
army and navy. (h) Strategic studies of possible phases of the war. (i) Initial allotment of resources. (j) Information service.

Joint Plan Making Body.

COMBINED LETTER OF INSTRUCTIONS, FROM SUPREME AUTHORITY

mprehends a statement of the strategic plan as embodied in the grand decision. This forms the first part of the letter. Then instructs the War and Navy Departments as to
the execution of the general plan. Lastly, makes the initial distribution of resources.

Joint Plan Making Body.

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PLAN AND ORGANIZATION OF TEMPORARY BASES

Plans and organizations will be prepared for each temporary base that is likely to be occupied. The following points will be covered:

(a) A detailed tactical study of the locality.

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STATE DEPARTMENT

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PLAN OF ORGANIZATIO FOR WAR

(a) The organization as prese
"Field Service Regulations, U
States Army," except as specifica
ified to fit special conditions of
probable theater of operations.

(b) Orders necessary for the e
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TENTATIVE PLAN OF A WAR PORTFOLIO

OUR POLICY

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y military restraint not com-
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E DEPARTMENT.

STUDIES OF ENEMY FORCES

ARMY

(a) Statement of forces in readiness and their present distribution. (b) Statement of time necessary to deploy forces in readiness in various theaters. (c) Statement of forces in reserve and their present distribution. (d) Statement of time necessary to mobilize forces in reserve. (e) Statement of time necessary to deploy reserve forces in various theaters. (f) Statement of efficiency, and morale of forces in readiness. (g) Statement of efficiency and morale of reserve forces. (h) Statement of abilities of available commanders. (i) Statement of peace organization of forces. (j) Statement of changes necessary to pass to a war organization and a full exposition of the friction entailed. (k) Statement of transports and supply vessels necessary to a strategic deployment in each area. (l) Statement of transports and supply vessels in service. (m) Comprehensive studies of each possible theater of operations both from an offensive and a defensive standpoint. Military geography. Sanitary conditions. Statistical information upon the resources of all kinds which the various theaters of operations afford. Fortifications and field works. (n) Comprehensive studies of lines of communication and operation to possible theaters of operations. Location of principal bases. Transportation facilities.

By MILITARY INFORMATION DIVISION.

NAVY

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By NAVAL INTELLIGENCE.

RESOURCES

(a) Statement of funds.
(b) Statement of credit.
(c) Statement of merchant vessels available.
(d) Statement of accumulated military stores and their location.
(e) Statement of reserve arms and ammunition.
(f) Statement of producing capacity for military stores, guns and ammunition.
(g) Statement of land transportation capacities.
(h) Statement of what may be obtained by importation.
(i) Statement of capacity for road and railroad construction and equipment.
(j) Statement of maintenance, repair and building facilities.
(k) Statement of probable or possible allies and the support they would afford.

By JOINT PLAN MAKING BODY.

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MISSION

A statement of what it has been determined to accomplish by the war.

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A complete analytical examination of the general situation from the enemy point of view and the deduction therefrom of his probable intentions.

OUR OWN FORCES

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army and navy. (h) Strategic studies of possible phases of the war. (i) Initial allotment of resources. (j) Information service.

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By General Staff.	By General Board.	By Joint Plan Making Body.

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ARMY ESTIMATE OF THE SITUATION

is estimate of the situation is a solution under the conditions tabulated of the war problem which the instructions of supreme authority presents to the army.

GENERAL MISSION

A statement of the task assigned the army by supreme authority. Here follows a study of the conditions from which is determined the:

FIRST MISSION

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ENEMY FORCES

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(a) Strategic studies of possible phases of war. (b) Tactical studies of localities.

Army Plan Making Body.

ANIZATION WAR

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PLAN OF MOBILIZATION FOR WAR

This plan shows:
(a) The forces that are to be mobilized and their composition. The sources from which they are to be drawn.
(b) The plan of their assembling.
(c) The plan for their equipment.
(d) The recruiting plan.
(e) The names of regimental, brigade and division commanders.
(f) The names of the principal staff officers and their assignments.
(g) The logistics of the mobilization.

PLANS OF STRATEGIC DEPLOYMENT FOR WAR

This plan shows:
(a) Localities where forces are to be deployed.
(b) Forces to be deployed in each locality.
(c) Times when successive steps of the deployment must be completed.
(d) Logistics of the deployment and subsequent support of the forces.
(e) Organization of communications.
(f) The manner of co-operating with the navy.

PLANS AND ORGANIZATIONS OF TEMPORARY BASES

Plans and organizations will be prepared for the principal temporary bases likely to be occupied.
The following points will be covered:
(a) A detailed tactical study of the locality.
(b) The forces likely to be necessary for its security.
(c) Plans of defensive works.
(d) Detailed plans of depots and base facilities.

By State Department.	By State Dep't and Special Advisers.	By State Depart

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By Naval Plan Making Body.

PLAN OF ORGANIZATION FOR WAR

This plan shows:
(a) The flow of authority in all its ramifications.
(b) The administrative grouping of the forces.
(c) The tactical grouping of the forces.
(d) The personnel of command.
(e) The staff personnel of chief command.
(f) Orders necessary for execution of plan.

By Naval Plan Making Body.

PLAN OF MOBILIZATION FOR WAR

This plan must show:
(a) The vessels to be mobilized.
(b) The composition and sources of their crews.
(c) The names of their chief officers.
(d) The dates when mobilization must be completed.
(e) The place of assembly.
(f) Plan of recruiting organization.
(g) Orders necessary for execution of plan.

By Naval Plan Making Body.

LOGISTIC PLAN FOR WAR

This plan must show:
(a) The initial requirements as to sup plies of all kinds.
(b) The probable requirements for sub sequent phases of the war.
(c) The sources of supply, and supplie available.
(d) The organization of the transports tion.
(e) The organization of the naval trai
(f) A list of available vessels, thei characteristics, whereabouts, and place of assembly and alteration, and perio required to place them in readiness.
(g) Detailed plans for necessary change in the vessels of the train.
(h) Detailed plans for the assemblag of supplies.
(i) Plan of the purchase, inspection an shipping organization.
(j) Orders necessary for execution o plan.

By Naval Plan Making Body.

NAVAL LETTER OF INSTRUCTIONS, FROM NAVY DEPARTMENT TO COMM

Comprehends a statement of the strategic plan as embodied in the grand decision, then the instructions of the department based War portfolios should be in the possession of commanders-in-chief.

By Naval Plan Making Body.

This plan of a war portfolio is based upon the idea that such a portfolio must not only comprehend the projet for al viz: *"Policy, Enemy Forces, Our Own Forces."* These studies are not comparative, but more nearly abstract studies.

The *Grand Estimate of the Situation* must be made by a body trained to estimate accurately the value of all the facto there must be the freest possible interchange of ideas to ensure thorough co-ordination of action. The plans of organiza results from a careful weighing of the factors involved. To preserve the value of the portfolio and to guard against the portfolio will find advantage in the adoption of a form for the various parts. Such forms will facilitate comparisons an

and field works. (n) Comprehensive studies of lines of communication and operation to possible theaters of operations. Location of principal bases. Transportation facilities.

EPARTMENT.	By MILITARY INFORMATION DIVISION.	By NAVAL INTELLIGENCE.	By JOINT PLAN MAKING BOD

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PLAN

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EXPLANATORY NOTE

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By Army Plan Making Body.

Y LETTER OF INSTRUCTIONS, FROM WAR DEPARTMENT TO COMMANDER-IN-CHIEF

t of the strategic plan as embodied in the grand decision, then the instructions of the department based on the army decision and appended plans. War portfolios should be in possession of commanders-in-chief.

Army Plan Making Body.

, it is first necessary to make studies of those conditions. These studies are contained in the first three grand divisions of the portfolio, derived from them may result disastrously.
he "*Army Estimate of the Situation*" may then be made by navy and army officers, planning in their respective spheres. But even here e estimates are not graphically outlined above, but the principle is recognized throughout, that each decision, no matter how minor, based is an aid to the reconsideration of the projet when new factors are introduced. Those charged with the work of preparing the o be examined *Form* is important.

Third, the employment of the best personnel, matériel, and facilities to carry out the project in the best way as previously determined.

Besides this there is the non-military conception that a war-plan comprehends all the stages of war, from its inception to its conclusion. It supposes that a plan can be outlined months in advance; that movements in the presence of the enemy can be predicted with precision; and that events can be shaped in entire accord with the wishes of him who draws the plans. It is needless to say that this conception is not received with respect by military minds.

The correct idea is less pretentious in its claims. It seeks to make positive arrangement for those phases of war which precede the first real conflict with the enemy. It covers in detail the plans for the preparation, and the plans for the movement of the forces preliminary to the opening of the campaign. Accepting this latter view, a war plan may be defined as a scheme worked out in detail for the preparation, support, and deployment in readiness for war, of the national forces.

But the scheme of such a plan has actually been devised by an officer of our own navy. It is in existence, it is logical, it is feasible. Shall we not give it life and form and development?

A casual glance at the plan is sufficient to show that here *for the first time* is the whole subject spread out before one in the form of a Mercator projection. Here and there earnest men have explored portions of the area of this globe but never before has a map of its whole surface been exposed to view. One has shown the relations of war and policy and the need for a council to co-ordinate them or the need for a larger fleet, or reforms in navy yards; another has made clear the improvements possible in the existing fleet, or the importance of a developing military character, but never before has the panorama of our future progress been laid out before one to be grasped in a coup d' œil, never before has a plan covered the work to be done by *both* the army and navy and shown the intimate inter-relation of each.

This completeness constitutes its most striking feature, but in trying to separate into its constituent parts so complex a subject it is well if at first we do not fasten our attention upon the light itself. Rather must we pass it through a prism of common sense and analyze its spectrum, taking each component ray and spec-

ulating on the union and composition of its substances. Otherwise we shall no longer have a guide, our senses will be blinded by detail and we shall grope our way more safely in conscious darkness.

The first section constitutes what may be called the information division of the plan. Here *in one place* are all the factors from which the council of national defence can decide as to our need for *future* forces, and the joint plan-making body as to the best distribution and use of *present* forces. This section is based primarily upon a series of exhaustive studies of our policies and those of our probable enemy. The relation of these national policies to war is so intimate and controlling that the data concerning them comes first of all in importance. To carry them into effect, the forces and resources on hand and to be supplied are then studied together with the bearing of international law on situations that are likely to arise. From an analysis of all this data flows the nature of the war and the direction of effort.

It is of interest to note the very considerable and responsible roles of the military information division and the Office of Naval Intelligence. It is our business to know at any instant exactly the number of ships each world power has in commission and building, the state of her personnel, and to question her motives in so far as they may constitute a menace to our situation in world politics. The duties of the State Department, especially before the beginning of hostilities, are also seen to extend over a wide range of matters of grave importance, and the wisdom of foreign practice in training their diplomats in a strict and *progressive school of actual experience* in subordinate positions is here sharply and involuntarily contrasted with our own.

The stream of authority is seen to run smoothly and consistently on from this thorough consideration of policy, enemy forces, and our own forces into a grand estimate of the situation laid before the President by the joint plan-making body. A *combined* letter of instructions is then issued from the supreme authority (the President) to the War and Navy Department comprehending a statement of the strategic plan as embodied in the grand decision. It also instructs them as to their duties in the execution of the general plan and finally makes the initial distribution of the financial resources necessary to enable these departments to operate.

Upon the receipt of this letter, orders are made out by the Navy Department to the commander-in-chief covering a statement of the strategic plan as embodied in the Grand Decision and the instructions of the department based upon the corresponding Naval Decision, and a corresponding set of orders is sent by the War Department to the commander-in-chief of the army.[3]

In pondering such a plan, we are struck with a sense of the order and sequence of it all, and there recurs to us something of the thought so well expressed by a letter in the archives of the War Department written during the Civil War by a colonel in the Union Army:

> The long intolerable monotony of nights alone in my tent! It is in periods of inaction such as this that one has time to turn the war over in one's mind, to stand off, as it were, and get a perspective of the whole seething whirl, and see it in its sexless, planless hideousness.
>
> If only we out here in the field could know that there was a real plan for us all, based on real reasons, how much easier it would be. If we could be the first nation to arrive at such a consummation how mighty we would be for all time. Unless we do someone else will be ahead of us and then we will run the usual and inevitable course.

This plan is not "the consummation," and may require some change after the first serious contact with the enemy, but at least it is the foundation of military preparedness to which we have all dedicated our lives. Unless we adopt something like it we too "will run the usual and inevitable course."

Unhappily it is only the bitter experience and recorded events of *its own* wars on which a nation builds its science of "the game." De Thou's vivid account of the great siege of Malta or the cold-blooded prophesies of Von Moltke that all came true or the more recent accounts of eye-witnesses of the horrors in Bulgaria—they all interest us perhaps; yet, in the main, they are of no *immediate concern*. Since more than a quarter of a century has mercifully elapsed between our wars, perhaps we should not wonder why we have not evolved a sequence for it long ago. It is as if, instead of turning on its axis once in 24 hours, the earth had taken as many years about it. If man's life has been of the same duration and for the initial steps of astronomy we had nothing to depend upon except observations recorded in his-

[3] Copies of the war plan should be in possession of both commanders-in-chief, so that in their execution the many contingencies that will arise may not cloud the real object to be gained.

tory, how many centuries would have passed before it would have occurred to anyone that in what he saw, night after night, there was any kind of order at all?

For us of the army and navy there should be nothing in the lapse of years between wars to justify this apathy of military mind in which we have been living. Ours is a definite profession that finds its culminating justification in victory swiftly won, in peace long maintained. And whether it be *victory won* or *peace maintained* the result will never flow from any inspiration that may be expected to come to the rescue of the indolent and the untrained. Whether victory or peace, we can insure it by means of one thing only—an elixir so powerful that a few drops in the blood of the nation will give it the strength of Atlas and the skill of Mars. Its name is Preparedness.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

STATE NAVAL VOLUNTEERS FOR THE RESERVE FLEETS OF THE UNITED STATES NAVY[1]

By LIEUTENANT C. C. GILL, U. S. Navy

Motto: A volunteer navy brings the people and the navy to a closer understanding; makes for a saner appreciation of national responsibilities; and is a policy of national defence in harmony with the genius of our national institutions.

The establishment of two powerful naval reserve fleets has brought into new prominence and importance the naval volunteer; and, since the conditions on board a modern warship demand a crew of sound physique and quick intelligence, this volunteer is no holiday sailor, but a capable man-of-war's man. The professional requirements are such that he is offered exceptional opportunities not only for travel and for military training, but also for a practical and technical schooling. An increased public interest in the volunteer navy is therefore justified, both by its potential value for the national defence, and by its intrinsic educational value.

Notwithstanding the fact that the state volunteer organizations are at present distressingly inadequate for manning the reserve fleets, an investigation of conditions affords evidence that there exists a fine spirit of patriotism and state pride, which, if properly fostered and developed by the states themselves and by the Navy Department, may be relied upon to supply naval volunteers of such esprit de corps and efficiency that they will make the reserve fleets a valuable accession to our naval strength. The purpose of this paper is to discuss ways and means of establishing cooperation between the federal government, the states, and the Navy Department, with the hope that it may assist in developing a practicable plan whereby a naval reserve personnel, fully sufficient for any emergency, may be organized and trained.

[1] Submitted for prize essay, 1914, and accepted for publication.

In the investigation of ways and means for accomplishing this, the experience of the United States with its naval volunteers in previous wars may prove misleading by inspiring false confidence in hastily assembled groups of untrained men. Conditions have radically changed: first, because of the establishment of two powerful *reserve* fleets; and second, because of the ever-increasing complexity of the modern man-of-war, making a *trained* volunteer personnel more necessary each succeeding year. Although little can be learned from a study of our own naval reserve history, some instructive points may be gathered from a study of the methods by which England's powerful reserve has been developed. But here again care must be exercised not to press the analogy too closely, because the conditions and circumstances pertaining to this question are quite different in the two countries. It is believed, moreover, that some of the features of the English system would not harmonize with the spirit of American democracy, and would not appeal to the type of American citizen whom we desire to attract to the naval volunteer organizations.

What constitutes an adequate reserve personnel may be estimated from the make-up of the reserve fleets to be manned. The Atlantic reserve fleet was established at the navy yard, Philadelphia, May 1, 1912, and the Pacific reserve fleet was established at the navy yard, Puget Sound, Washington, on March 25, 1912. The composition of these fleets on July first was as follows: In the Atlantic—nine battleships, four armored cruisers, three scout cruisers, six cruisers, two destroyers, seventeen torpedo-boats, four submarines, and three colliers In the Pacific—one battleship, two armored cruisers, nine cruisers, four destroyers, four torpedo-boats, two submarines, one tender and one monitor. These fleets are ready for sea as regards *materiel,* and are governed by regulations and routine drawn to keep them in constant readiness for sea.

For each of these ships the Navy Department has determined a reserve complement of "regulars" numbering about one-fourth the prescribed full complement, and consisting of officers and men of appropriate ranks and ratings to provide a well-balanced nucleus. It is, therefore, the function of the naval volunteers to supply three-fourths of the prescribed full complements of these ships, comprising officers and men of the proper ranks and ratings, to fill out the nucleus crews of regulars. For the reserve battle-

ships, three-fourths the average complement for each ship numbers about 400 officers and men; for each reserve armored cruiser, about 625 officers and men; for each reserve destroyer, about 56 officers and men. The total number of naval volunteers required for these two fleets is approximately 15,000 officers and men.

In considering the available sources of naval reserve personnel, it is appreciated that nearly all ex-man-of-war's men can be relied upon to volunteer in the event of war. In view, however, of the difficulty of organizing and training these widely scattered ex-man-of-war's men in times of peace, it is apprehended that to rely upon them to man the reserve fleets in time of emergency would be to court delay and confusion. Ex-man-of-war's men who would not or could not join state volunteer organizations, might be utilized to advantage for such service as duty on board ships in full commission, converted merchant vessels, transports, auxiliaries, and duty at navy yards, naval stations, and shore signal stations, as might be expedient.

The active and retired personnel of the United States merchant marine is another source of naval strength, which, for the most part, however, would be needed to man merchant ships pressed into war service.

It may be remarked, as having some influence in determining the most advantageous disposition of ex-man-of-war's men and ex-mariners of the merchant service, that team work is essential to the attainment of battleship efficiency; and in order to attain team work it is important to avoid any combination which might menace harmony and coordinated effort. It is also desirable that the same officers and petty officers who have previously organized and drilled the volunteer personnel should command in the event of actual service. Therefore it would seem advisable to encourage ex-man-of-war's men and ex-mariners of the merchant service to enroll in the state volunteer organizations, and in so far as is practicable, to keep these organizations intact, that they might be utilized to fill out the nucleus crews of regulars on board the reserve warships.

If it be objected that these state organizations are incapable of supplying the required number of trained officers and men to man the reserve fleets, we will readily admit that this is open to argument; but until the experiment is carried further, we are not

entitled to conclude that it is impracticable, or that the effort is too prodigious; nor is it believed that the states should be suffered thus to absolve themselves of this responsibility. In addition, if the states are given the definite task of manning certain ships, it may be expected that many will respond by supplying complete reserve complements. Better results will thus be secured, because a well defined task means increased interest, with a more enthusiastic and better coordinated support.

As to what the states can or cannot do, opinions differ, but nearly all agree as to the urgent need of devising ways and means by which the reserve fleets may be placed in fighting trim in the shortest possible time; and evidence now available seems to indicate that the most practicable and expedient way to accomplish this is to develop an adequate state naval volunteer personnel. Such a personnel for the reserve warships may be defined as an organized and trained personnel, ready to be incorporated with the nucleus "regular" crews, to the end that battle efficiency may be attained without delay or confusion.

In discussing this subject a perplexing difficulty is encountered in the fact that information gathered from a study of official records and from discussions by naval officers and naval militia officers indicates a wide diversity of opinion respecting nearly all the pertinent questions. This diversity of opinion, however, seems to be a natural consequence of the different degrees and kinds of proficiency attained by the various state naval militias. This lack of uniformity is due to the fact that each state has been left largely to itself to formulate its own standards and methods of training. We should, therefore, in order to entertain a just view of this subject, judge the future usefulness of state volunteer organizations not so much by the conditions generally existing at the present time, as by the conditions which it has been shown will result from proper development; and it is believed that a satisfactory understanding on this point may be arrived at, and confusion of thought obviated, by citing some particular naval militia organization as representative. In this way ideas based upon facts will be set forth, and it is hoped these ideas may assist in evolving a practicable plan for the development of all state naval militia organizations.

Before going further it is desired to point out that no invidious comparisons are made, nor are any unwarranted assumptions in regard to other naval militia organizations inferred, when the second battalion of the naval militia of New York is cited as a representative volunteer organization which has profited by favorable conditions of encouragement and supervision. By reason of recent achievements this battalion is particularly suitable for the purpose of this discussion.

It was organized in 1897, and in its early days was officered largely by Naval Academy graduates. Upon the outbreak of the war with Spain, which occurred in the following year, the battalion recruited up to its full strength. Practically the entire personnel entered the auxiliary navy, and in conjunction with the first battalion supplied 51 officers and 800 men, manning in whole or in part 40 vessels. The duties performed were patrolling mine fields, running signal stations along the coast, manning converted yachts, colliers, converted merchantmen, and also doing blockade duty off Cuba.

After the war the battalion secured from the city of New York a location on the shore of Upper New York Bay, where the finest naval militia armory in the world was constructed. A basin provides space for two navy steam launches, four cutters, and the converted yacht *Gloucester*. The building contains a large drill hall, equipped with two military masts for signal practice, a 4-inch rapid-fire gun, and a 5-inch loading machine. This armory is used for infantry and field artillery drills, as well as for indoor athletic work. Each division of men has an assembly room, beneath which are rooms fitted out with individual steel lockers. A 100-yard rifle range, with 12 firing points, affords opportunity for rifle and revolver practice. One-pounder guns and three-pounder guns have also been mounted for subcaliber practice at moving targets.

During the winter months, from November to April, indoor drills are held one evening a week. For these drills the battalion is divided into classes determined by length of service; the first year men being taught together, etc. These classes report to different instructors, who have been selected for their proficiency in the subjects allotted; *e. g.*, the navigator teaches seamanship, the ordnance officer teaches gunnery, etc. Instruction is given in accordance with a prearranged schedule covering the entire en-

listment period of three years. After an hour of this instruction, drill recall and assembly are sounded, and the battalion is formed for infantry or artillery drills, parades, or reviews.

About May 1 the *Gloucester* is placed in commission. Evening drills are held on board, and throughout the summer she is taken out for week-end cruises. At the same time steam launches and cutters are hoisted out for drills during the summer, and the divisions rotate in the use of the floating equipment.

For a number of years annual cruises covering a period of seven or eight days have been made on board battleships or other naval vessels. During these cruises the officers and men have gained experience and received instruction by various methods. Sometimes they have been assigned duty as running mates with members of the regular crew, while at other times they have been incorporated with the ship's complement of regulars.[2]

Last summer this battalion made a cruise to Bermuda on board the *Alabama*. In order to make the drills both interesting and instructive the course of training was planned on the supposition that war had been declared, and that the aim of all hands was to prepare the ship for battle as quickly as possible. To accomplish this end the volunteers were incorporated with the regulars in such a manner as to break down the distinction between regulars and volunteers.

The report submitted by the commanding officer of the *Alabama* to the Navy Department, stating that in his opinion the character and previous training of this state naval volunteer organization were such that a two weeks' period of uninterrupted training would suffice to prepare the ship for battle, epitomizes achievements which render this organization a valuable factor in the national defence, and illustrate what may be accomplished with adequate moral and financial support from the state and the Navy Department.

It is generally conceded that there is no field of human efficiency where previous training, thoroughness, discipline, and obedience are more essential than in the case of the personnel on board a battleship. The difficulty in times of peace of recruiting the requisite high order of intelligence and physique, is well rec-

[2] Acknowledgment is made to Commander Kingsley L. Martin, New York Naval Militia, commanding the second battalion, for assistance giving in preparing this historical sketch.

ognized, and while the war-time patriotism of our citizens may be relied upon to supply the *numbers,* nevertheless the necessary *trained personnel,* both officers and men, to man the ships in reserve, will not be forthcoming on short notice unless the naval volunteer organizations are so fostered in times of peace as to produce them. Therefore the entire country owes a debt of gratitude to New York State and to other states, the patriotism of whose citizens is evidenced in efficient military organizations of such value.

But, as has been pointed out, the naval volunteer personnel represented in the various state naval militia organizations to-day, when considered as a whole, is wofully inadequate. And it is with a view to assisting in the development of a practicable and expedient plan for organizing and training an adequate naval volunteer personnel that the following points, based upon evidence deduced largely from the example cited above, are set forth.

The development of these state organizations in size and efficiency depends upon two considerations: first, what the respective states are willing to do and can do; second, the recognition and encouragement accorded by the Navy Department.

The first of these considerations depends entirely upon the state concerned; and a condition involving perplexities for the Navy Department is that the states differ widely in support accorded the naval volunteer, and in their conception of standards and methods for organization and training. To a certain extent, however, this difficulty can be overcome by placing the state naval volunteers in time of war under federal control, and in time of peace by basing the degree of recognition and encouragement accorded by the Navy Department upon the size and ability of the respective organizations, the Navy Department to estimate this war-time usefulness of all naval volunteer organizations by applying the same criteria and rules to each one.

Economy of time is of paramount importance; and in order to assure training and development along the proper lines, it would appear necessary as a preliminary step to determine as definitely as possible what these criteria and rules should be. Standards for measuring professional ability are difficult to define, but for the purpose of this paper it will suffice to say that the criteria for the naval volunteers may well be the same as the standards for the regular service. The rules, however, for testing

the proficiency attained by naval volunteers should, for obvious reasons, be so framed as to make the requirements practicable of fulfilment. For example, it would be unreasonable to require a lieutenant in the naval volunteers to possess the same technical knowledge, or to have had the same amount of practical experience, as is required of a lieutenant in the regular service. But it is not unreasonable to require a naval volunteer officer to have a good general idea of ship organization and the functions of each department, to the end that when assigned some specific province in accordance with his natural inclination and adaptability, he can, after specializing in the duties required by his specific province, perform these duties in intelligent cooperation with the other departments of the ship under the conditions which would obtain when called out for actual service. From this it would appear that specialization is essential to the successful training of naval volunteers; and in order to specialize it is necessary to have a system by which each officer and man may know as nearly as possible what duties he would be called upon to perform in the event of war.

This could probably be accomplished without much difficulty by designating to each naval volunteer organization the reserve ship to which it would be ordered in the event of war. In the case of small organizations, if it were considered necessary or advisable to combine two or more on board one ship, each organization could be informed of what its respective province would be; that is, exactly what ratings and stations in the ship's watch, quarter, and station bill it would be expected to fill. This could be effected by supplying the naval militia organizations with copies of the respective organization and administration books for the ships to which they are assigned, the ratings filled and ship's numbers occupied by the nucleus crews of regulars to be indicated in the books. The positive knowledge of the ship to which they would be ordered, if called out for service, together with the information to be gathered from these ship organization and administration books, would make the assignment of individual duties practicable, thereby permitting specialization, stimulating interest, and greatly facilitating training and preparation for active service. Such a plan would conform to the principles of "scientific management" and "efficiency" now in universal application in industrial work, the fundamental idea being to assign a

definite task to each individual which will demand all his effort for its accomplishment.

The services which would be required of each individual naval volunteer in the event of war thus being defined as clearly as possible, it would appear practicable for naval volunteer officers and men, even in the comparatively small amount of time which they have to devote to naval training, to attain considerable proficiency in the performance of their duties; and it would not appear to be asking too much that officers and men should, in their respective provinces, come up to the standards of the regular service. In making service standards the criteria for the naval volunteer, it should be understood that only by the sweeping modification of applying these standards in the restricted highly specialized province alone, would such a plan be practicable; and even with this modification, volunteer officers, and leading petty officers especially, will find the task before them worthy of all the study and time they can devote to it.

This plan is based, as has been said, upon the principles of scientific management which business men have developed by thorough analysis of the methods by which the maximum efficiency may be obtained. The fundamental idea of these principles seems to be: first, to set a task and prescribe exactly how it is to be done; second, to offer some kind of reward or bonus for doing the task in the prescribed method and time; and third, to have staff men, thoroughly versed in the business, ready to direct the work as may be necessary, and to give help and encouragement to those who require it. The application of these principles to the naval reserve proposition may be briefly outlined as follows: The Navy Department to study each organization and determine the maximum service it can be expected to perform, having due regard for size, efficiency, geographical limitations, state support, etc.; the definite task then to be assigned accordingly, and the Navy Department to follow up this assignment with the advice and encouragement needed to promote the accomplishment of the task.

NOTE.—Potential officers for the state naval militias might receive preliminary training in military and naval schools. Last summer about 50 cadets from the Culver Naval School made a ten-day cruise on board the battleship *Alabama*. Previous military and naval training combined with esprit de corps made for adaptability to ship life, and a consequent advance

in naval training quite astonishing in view of the small amount of time devoted to drill and instruction afloat.

The Navy Department might adopt a plan similar to the one the War Department has used so effectively to encourage the work of military schools, and annually, as a result of its inspection, designate a certain number of naval schools as "distinguished institutions."

Having pointed out what would appear to be the field of greatest utility for the state naval volunteer, and also having indicated a method by which it is believed the Navy Department might determine the degree of recognition and encouragement to which each particular volunteer organization in this field was entitled, the next step will be to ascertain along what lines this recognition and encouragement should proceed to secure the best results.

The Navy Department's present policy is productive of excellent results; but it would appear that the recent establishment of two powerful reserve fleets warrants an amplification of this policy. A step in this direction has already been made by sending various state militia organizations on board reserve battleships for summer cruises, and it is believed that the practical lessons taught by these cruises will prove a lasting benefit. As a further advance, it is suggested that it would prove a most valuable spur to endeavor, if the department not only designated the reserve ships to which each volunteer organization would be assigned in the event of war, but also, when practicable, ordered these ships to ports convenient for the respective volunteer organizations to hold drill on board throughout the year.

If each state possessing an efficient naval volunteer organization were assigned a reserve ship, state pride would then be aroused to see that ships so assigned were manned in such a way as to reflect credit upon the respective states, both in time of peace and in time of war. In time of peace, state pride would assure a fine spirit of friendly rivalry, which, if properly fostered and directed, might prove valuable not only in attaining battleship efficiency, but also in promoting interstate acquaintance to common advantage.

Conditions in a fleet are peculiarly suitable for furthering these ends, and when the reserve ships mobilize for target practice, maneuvers, inspections, etc., opportunity is afforded for competitive tests. The attractiveness, combined with the genuine usefulness of this scheme, will appear in the picture of the reserve

fleet mobilized at Newport, where the seaboard states represented would compete at target practice in the forenoon, and at boat racing in the afternoon, or perhaps assemble on the athletic field to watch a baseball contest between New York and Massachusetts. Such wise combination of work and play should appeal to the type of citizen needed in the volunteer service.

It is presumed that the Navy Department would demand certain professional requirements as a condition precedent to allowing the assignment of a ship. In case a state failed to supply a force capable of demonstrating naval efficiency to the satisfaction of a board of regular officers appointed by the Secretary of the Navy, the Navy Department would be justified in not assigning a reserve ship to that particular state, or in withdrawing any ship that might have been previously assigned. This would seldom be necessary, however, because the states could be generally relied upon to guard against such humiliation.

For obvious reasons it would be generally inexpedient to use battleships for week-end cruises, and therefore the smaller vessels at present assigned to the state organizations would continue to be useful for these short cruises, thus affording means for teaching the art of "sailorizing."

As has been previously remarked, the development of state naval volunteer organizations depends upon two considerations: first, what the states are willing to do and can do; and second, the encouragement and recognition accorded by the Navy Department. These two considerations are interrelated and interdependent in such a manner as to render confusing any attempt to discuss one apart from the other. What the naval volunteers accomplish depends more or less upon the recognition and encouragement accorded by the Navy Department, while on the other hand much of this recognition and encouragement is awarded according to the efficiency of the volunteer organizations concerned. Notwithstanding this it is believed feasible to establish lines of cooperation between the federal government and the state governments which will prove valuable not only in developing an adequate naval reserve personnel, but also in overcoming a political objection which has frequently been raised against increasing the strength of our navy.

There seems to be evidence that many excellent people oppose increase in the army and navy not so much because they con-

sider this increase unnecessary to the policy of an adequate national defence, as because they consider it incompatible with the genius of our institutions to lodge so much military power in our central government. Nor is it difficult to conceive reasons which might influence patriotic citizens, notwithstanding their appreciation of the need of a stronger defence, to favor caution in preventing conditions under which the individual states might find the power of their votes insufficient to protect their state rights. It would appear that the establishment of efficient state volunteer organizations provides a good way out of this difficulty, by allowing the principle of wise caution in protecting state rights without sacrificing the principle of an adequate defence.

The question of what the states are willing to do to encourage state naval volunteer organizations is perhaps the most important of all those affecting this subject; and this in turn is largely a matter of education as to the necessity for these organizations. It is to be remembered that the naval volunteer is the product of public opinion in the state he represents, and it would seem futile for a state to attempt to support an efficient naval volunteer organization, if public opinion were against it. However, public opinion may easily be favorably influenced by the proposed scheme, on account of its educational value, and if successfully carried out, it will bring the navy and the people closer together. This closer association will make the people understand the navy better, and by creating a wider knowledge will operate against the short-sighted arguments opposed to the policy of an adequate defence. The states, moreover, should realize the value of a naval training for their citizens since the navy is an exponent of the competitive progress which makes for success in every field. Just as the struggles for progress in civil life result in the survival of the fittest fighter, so any test of our navy in competition with a foreign navy will result in the survival of the fittest fighter. This fittest fighting navy will be the product not so much of war-time patriotism as of peace-time patriotism evidenced in the unrecorded every-day fights by which the navy, together with the nation it represents, advances in civilization. War-time patriotism will supply us with an abundance of volunteers, but whether these volunteers are trained efficient fighters, or ineffectual raw recruits, will depend upon our every-day patriotism. It is easy to keep awake when the storm is upon us, but it re-

quires a much higher sense of duty to keep awake when the ship of state is jogging along under full sail, with fair winds and a clear sky.

As was said at the beginning of this paper, in addition to the fact that the establishment of an adequate naval volunteer personnel is of great importance to the national defence, there is other ground on which this subject deserves public attention and support. The historian Robert W. Neeser has set forth the broad unbiased view that the navy is not a mere collection of fighting machines, that is to say, dogs of war awaiting the command to rush forth to combat, but has become a large national university for training the citizens of our republic. The battleship is not merely a fighting machine, but it is in every sense a complete and splendidly equipped manual training school. But even more important to the naval volunteer than this technical training, are the lessons learned in developing naval efficiency, the qualities constituting which the *London Times* enumerated as "self-reliance and resource, calmness and self-possession in emergency, quickness of eye and steadiness of nerve, steadfastness in danger, self-helpfulness in difficulties, and a quick sense of comradeship."

It is believed that these considerations, coupled with patriotism and state pride, will attract to naval volunteer organizations men of such ability and zeal as will make it possible to obtain the desired results in the necessarily short periods of training. Moreover, such a scheme for strengthening the national defence would be carrying out the fundamental principles of our republican form of government, and it would not seem a too sanguine speculation to expect that valuable collateral benefits might result from the development of a system wherein a large number of patriotic organizations were engaged in useful, unselfish work in the service of state and country under such conditions as would tend to develop cooperation between the federal government, the state governments, and the people.

The conclusions which appear to follow are: first, that the naval reserve is an important part of our policy for national defence; second, that owing to the conditions which exist on board a modern man-of-war, it is imperative that the naval reserve personnel should be carefully trained in time of peace; third, that it is both practicable and expedient to develop an adequate reserve personnel by cooperation between the federal government, the

states, and the people, in which the state naval work is supervised and encouraged by the Navy Department; and lastly, that, because of the necessity of economizing in time, the work of preparation and training should proceed in accordance with a carefully thought-out and clearly defined plan.[3]

[3] This article was written prior to the appearance of the Naval Militia Law which is reproduced in the Professional Notes of this issue.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

INTRACOASTAL WATERWAYS—THE CAPE COD CANAL [1]

By Lieut. Commander A. St. Clair Smith, U. S. Navy

The attention of the naval service at large has been drawn on occasion to the question of inland waterways, canals more particularly, or canals and natural waterways combined. This movement in recent years has had more especially to deal with what are known as "intracoastal waterways," and refers to various plans, schemes and suggestions to connect certain of our coastwise cities by inland canals for the transportation of freight principally.

Being interested to a greater or less extent in all matters pertaining to the sea, we look at such things with some indulgence and gladly read the articles that come easily to our notice. There is, however, to us all an underlying knowledge and a certainty that such matters are of much more than casual interest to us. A canal up and down our East Coast, or along any portion of it, is a military asset of great and undisputed value. We want them, will be glad to see them come, and would encourage them had we the chance. However, we realize that the construction of any such waterways must and will only come through demands and needs of the commercial world. As soon as this need becomes sufficient, the population dense enough, the rail rates high enough, the investment good enough, water transportation will inevitably come here as it has in Europe.

That this time is closely upon us, to no small extent at least, is well shown in many quarters. In 1909 provision was made by Congress for a thorough survey and report by the Engineer Corps, U. S. Army, as to the feasibility of the "Intracoastal Waterway

[1] Most of the statistics of this article were taken from H. R. Document No. 391, Intracoastal Waterway, Boston, Mass., to Beaufort, N. C. Section (1912) to which acknowledgment is made.

from Boston to Beaufort, N. C.—this in response to the demands of our East Coast trade. A private company has grasped the most important link in the chain and is constructing the Cape Cod Canal. The soundness of the business judgment that has built this canal will be increasingly apparent to us all as time goes on. Canada has undertaken the very extensive task of deepening the St. Lawrence River for ocean traffic to Montreal, and this is undoubtedly but the first step toward realizing the possibilities of her many natural waterways.

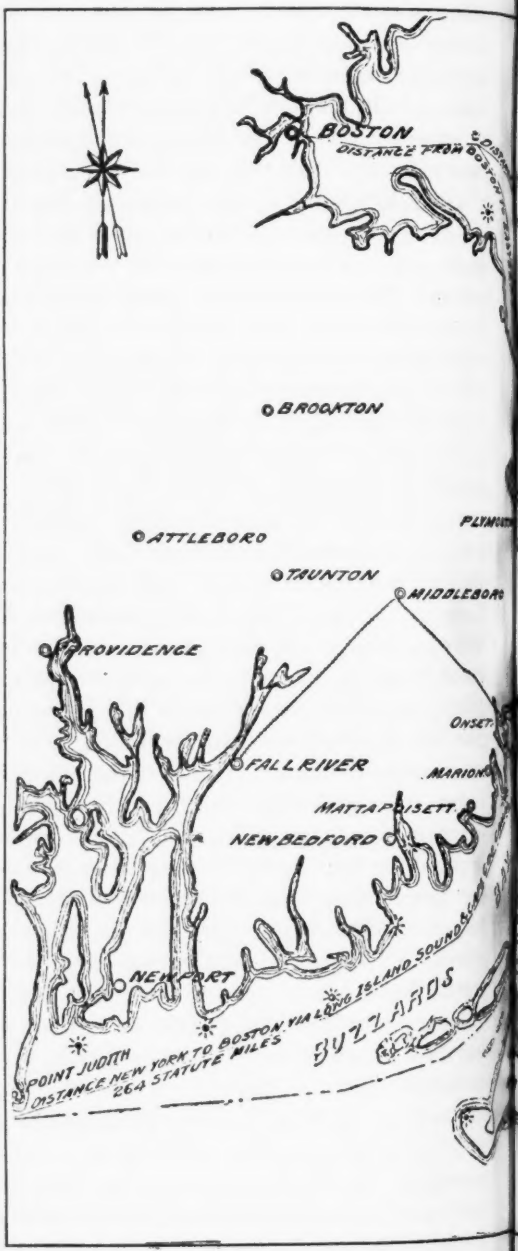
There is, perhaps, little need to show the vast field for any attempt tending to improve transportation facilities of the Eastern section of our country. Not so many years ago the Great Lakes were absolutely unutilized as an avenue of commerce. Now the Sault Ste. Marie Canal carries much more traffic than the Suez Canal, and this in competition with the numerous railways which have nearly all advantages, except the one of ability to carry in bulk. Our East Coast canals when they come will have the same advantages, and some others besides.

According to the census report of 1904 the industries in the Atlantic States used raw material to the value of four and one-half billions of dollars, and turned out a finished product valued at seven and three-quarters billions per annum. About three-quarters of this occurred in the states from Maine to North Carolina. The mineral production of the same region was valued at $591,000,000; the farm products, according to the Department of Agriculture, at $688,000,000; the lumber at $225,000,000. Practically all of this material was moved in one direction as raw product, and a considerable portion of it in the opposite direction as the finished article. The privilege of transporting the product that these absolutely incomprehensible figures represent is a prize which will always be a gold mine to those who are able to do it the most economically. The railways have, up to now, had a monopoly of much of this traffic, and the chance for water transportation is evident. The enormous field will always be there, and moreover, the greatest and most rapidly growing industrial district in the United States lies within this region. It goes without saying that the question of the transportation of these vast products is vital to the welfare of the country. The extreme importance of the question of transportation has long been recognized, and the Interstate Commerce Commission has had no question of more moment before it than that of

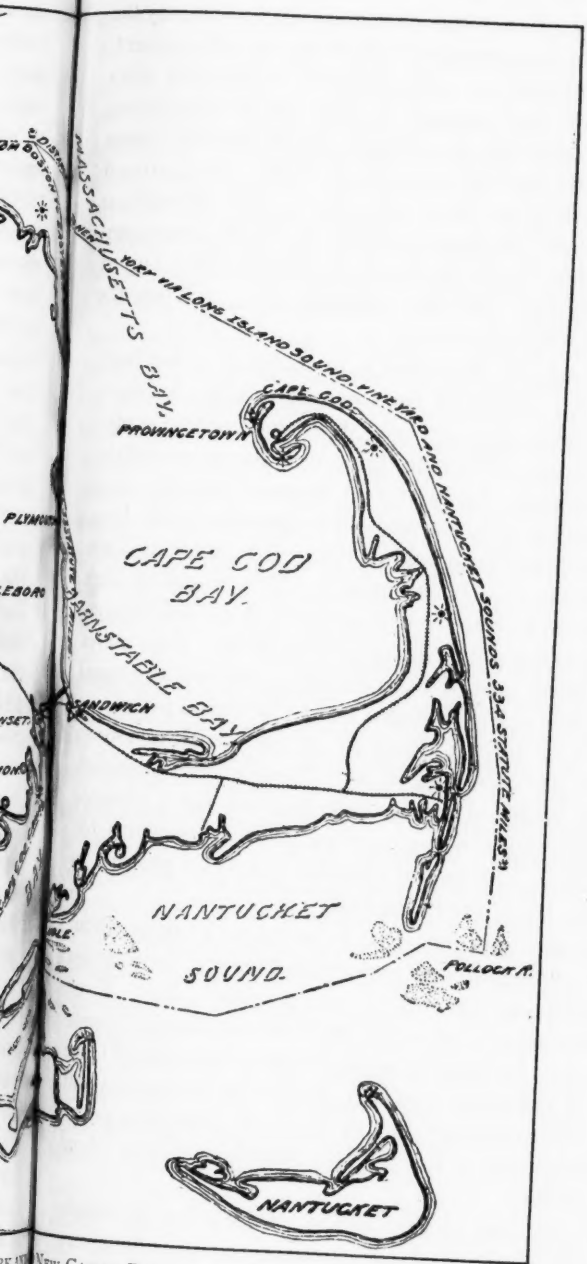
transportation rates. Railway rates are high and probably will always be so—compared to water rates at least. The present very emphatic demands by the railways for increases in these rates seem to indicate that, lacking very much increased facilities, such as water transportation, there is small chance of relief, or, indeed, little to be expected other than further advances.

The field, then, for canals seems enormous. It seems clear that their construction is bound to follow as soon as it is evident that there will be adequate return for the large amount of capital involved. This is as true for canals constructed by the government as it is for those built by private capital. A very considerable opposition will develop, no doubt, and will perhaps be most vigorous from those who control the immediate competing lines. Railroads having long held the control of all facilities will see danger to themselves. Indeed there is good evidence that protection from difficulties in this direction has been already sought in getting control of terminal facilities at many ports likely to be affected. However, opposition of this character while vigorous and hindering at the start will not be lasting. The history of the Manchester Ship Canal shows much opposition, particularly from Liverpool, which feared a loss to her shipping interests. The completion of the canal, however, has actually increased the tonnage of the port of Liverpool rather than lessened it. The same is true in Germany. She has doubled her railway mileage in the last thirty years, whereas the tonnage carried over these lines has quadrupled. The water mileage which, on the other hand, has not materially changed, has increased its tonnage five times. Our own railways opposed the opening up of water transportation on the Lakes, but the figures show that the opening of these same waterways has been one of the largest factors in the growth of the railways themselves. Furthermore, a waterway once well started and with a section built is very sure to grow and add to itself new lengths. Each unit adds materially to the strength of the whole by lengthening the haul and opening up new territory—and this seems to be even truer than of a railway.

The Cape Cod Canal was the most serious attempt in many years at a commercial canal in this country. This locality has always seemingly offered the greatest advantages for the least effort. As early as 1697 the General Court of Massachusetts appointed a committee to survey a route across the neck of land separating Cape



MAP SHOWING SAVING OF TIME BETWEEN NEW YORK AND NEW CANAL P



NEW CANAL PASSAGE AS COMPARED TO OUTSIDE ROUTE.

Cod and Buzzard's Bay. From that time until the present day the matter has been under consideration either by the government, by shipowners, or by capitalists. The distance is but eight miles and the surface is low, and seemed to offer small engineering difficulties. The avoidance of the dangers of the outside routes was most advantageous and the amount of traffic going around Cape Cod has for many years been very great. But the various attempts, up to now, have all ended without the canal being completed. In 1907 a company, at the head of which is Mr. August Belmont, began operations, and this summer, 1914, will see the opening of this long anticipated route.

The northern entrance of this canal is 30 miles in a southerly direction from Boston. Here, off the town of Sandwich (Barnstable Bay), a stone jetty 3000 feet long, has been built to protect this entrance of the canal. Minor dredging operations behind this breakwater have provided a basin and an approach for the canal itself. The latter, which is seven and three-quarters miles long, cuts through the marsh and high land of the neck connecting Cape Cod with the mainland of Massachusetts. The so-called high land, however, is but 29 feet above high water and the soil is principally sand, interspersed with occasional boulders. Four miles of dredging in the upper end of Buzzard's Bay connect the canal proper with deep water at the southern end. The canal prism is a cut which is at first to have a depth of 25 feet, with a bottom width of 100 feet in the narrowest parts. The northern approach proper has a bottom width of from 200 to 300 feet for a distance of 7000 feet, and the southern approach has a 200-foot width for a considerable distance. There are also two points of passage in the canal itself where the width is 250 feet.

The distance of this southern end from New York is about 220 miles (statute), and of this all is protected except the 60 miles between Point Judith and the entrance of Buzzard's Bay. Even here there are several safe harbors of refuge that are easy of access. The outside route, *i. e.*, through Vineyard Sound, but around Cape Cod, has a length of 334 miles (statute), so that the saving is about 60 nautical miles from Boston to and from all southern ports. The saving for vessels going around the Nantucket South Shoal Light Ship is 144 miles.

The saving of time due to this saving of 60 miles to vessels averaging a scant four miles an hour amounts, in a year, to a very

considerable amount; but there will be really much greater saving due to the curious differences in the weather conditions in the two localities traversed. This is principally due to the difference in the percentage of fog along the different routes. At the Pollock Rip Light Ship the record shows an average of 1082 hours of fog per annum, compared to 277 hours at the southern entrance, and 564 hours at the Sandwich entrance, of the canal. Leaving aside other dangers to navigation this means that vessels using the canal will have less than half the fog to contend with that those rounding the Cape will have. When, however, the uncertain currents of the Nantucket Shoals and the dangerous storms that have made this section the graveyard of so many ships are taken into consideration, the saving and freeness from risk of the canal route will become more apparent. The number of vessels wrecked on this particular section of the coast has averaged 35 a year for 50 years, and it is interesting to note that the outside rate for marine insurance is 8 to 12 per cent, whereas the inside rates, *i. e.*, lake and river, is but 4. When the proposed coastwise canals are completed there is no reason to believe that the rate for vessels using these routes will be much in advance of the inside rates.

A further very material saving will be made in the original cost of the vessels engaged in carrying what now goes outside. It is somewhat startling for a seafaring man to find that the cost per ton for construction of ocean-going vessels is $75.00, whereas the cost for lake vessels is $41.50 per ton, and for tugs and barges, such as are used on rivers and other protected waterways, is but $12.00 per ton. We are so used to our own heavily-built ocean-going craft that we do not realize that vessels can be built for half or less, that are not only perfectly satisfactory for the service demanded, but also can be insured for less than half of what is demanded at sea. This is probably not a measure of the comparative dangers of the sea and the lakes, but it certainly is a pointer in that direction.

As soon as the canal is completed the savings due to the shorter distance and to the avoidance of fog will begin to be felt. It seems, however, that perhaps the greater part of the present delay is due to waiting for favorable weather to get past dangers of the coast. With these dangers cut out progress will be just so much faster. In this respect it is an interesting fact that the speed of tugs and barges up and down our coast is seldom more than 3 to

4 knots an hour, and in rough weather is frequently less. This means that the canal will cause no delay to this class of traffic due to having to slow down. Indeed a 3000-ton barge, which is the commercial size which seems most desirable at present, can be permitted to tow through a 25-foot canal at some 9 knots without damage to the canal prism. The usual speed for steamers of about 23 feet draft will be about 5 knots. There is no reason to suppose that these speeds cannot be maintained at all seasons. The possible difficulties due to ice in winter are not likely, because of the fact that quiet reaches of rivers in the vicinity have seldom been so frozen as to endanger or delay traffic. When allowance is made for salt water it seems doubtful if the ice question need be given serious consideration.

Turning to the question of the commerce of New England and its economic conditions, we find that this canal should have no lack of business. The waterborne commerce alone, which has been of recent years going around Cape Cod, amounts to 25,000,000 tons annually. This is only a part of the product going to and from the 4681 manufacturing plants of this part of New England. The value of these plants is in round numbers $375,000,000, and the value of their products is $430,000,000. The value of the waterborne tonnage using waterways tributary to this canal is $527,000,000. This is composed at present largely of raw materials, such as coal, oil, plaster, lumber, etc. The finished products are largely handled by the railways, and the freight rates for this section of the country show that transportation here is more expensive than anywhere else in the United States, except California. The average ton-mile revenue in the United States is $ .759, whereas the revenues in New England are $1.145, and those on the New York, New Haven and Hartford Railway are $1.436, nearly twice as much as the average. This would seem to indicate that the entrance into the field of any competitive carrying organization would lessen materially the cost of the many products carried back and forth.

The comparative carrying abilities of such a canal as the Cape Cod Canal, in reference to a railroad, present astonishing figures. The comparison is more or less rough perhaps, and is made for a maximum load in both cases, but it is as true for lesser loads. Taking a double track railway (each way) it is figured that this would permit of 75 trains being despatched per day.

Double track railway freight line capacity is 168,750 tons per day each way. This is for a minimum headway of 75 trains per day and a speed of 18 miles (average) per hour. Length of trains is 45 cars of 50 tons each.

The freight movement by a canal is estimated as follows: With vessels of 3000 tons capacity spaced five to the mile, and running six miles an hour the freight movement would be 2,160,000 tons per day (one way), nearly 13 times as great.

Both quantities seem exaggerated, though the comparison is probably of value. It should also be borne in mind that the chance of interruption of a waterway is very much less than it is for a railway.

The comparative expenditures for the two show no such discrepancies as the comparative capacities. A double track railway, including bridges, through a well-populated, rolling country, costs roughly, $75,000 to $100,000 a mile. A mile of waterway, through the same sort of country, but without any large engineering undertakings, is about $490,000 per mile, say 1 to 5.5. However, capacity to carry such large amounts as these depends as much on the terminals as on the transportation lines themselves, and only the most ample terminal facilities could handle the loading and unloading of these quantities.

There is no question, however, of the immense advantage of the canal over the railway, and while this is true of peace times it becomes very much more so when considered from a military standpoint. The transportation of the ordinary commercial articles is generally done in much smaller sizes and amounts than those necessary for war times. Large articles are not, in peace times, ordinarily moved under such pressure as our big guns, forgings, armor plate, etc., are likely to be in war times. These and other war materials lend themselves very much more readily to water transportation than to rail. Take an army division, for instance, to use an extreme case. Such a movement by water would be quite a sufficient task, and its many advantages to rail transportation will readily suggest themselves. But the congestion to railway traffic caused by the movement of a division for even a short distance may be imagined from the following estimate by Colonel Schofield of the Quartermaster's Department of the army. When the movement is for any considerable distance the temporary loss of some of the units seems a certainty. To move, then, a

division consisting of 19,850 officers and men and 8265 horses, total, 142,172 gross tons, would require

395 passenger cars.
78 freight (box) cars.
344 stock cars.
144 flat cars (for wagons, guns, etc.).

Total 958

It is easily seen that a single movement of this character would throw out of gear, as far as other traffic was concerned, for a considerable period the railway which attempted it. Water transportation is in every way to be preferred where possible, and it seems that the greatest military value of a canal would be its ability to handle the transportation of military units and of purely military and naval stores, leaving the railways to carry the newly-made products that have to be assembled in such quantities in war time; field guns, small arms, ammunition, clothing, etc., but more important than all else, perhaps, foodstuffs.

It is true that the ability to send by inland waters small units of the fleet might be of most vital importance to us. Such movements, however, would pertain to defensive tactics only, while the movements of military units, stores, etc., would apply to both offensive and defensive tactics. That the ability to move submarines, torpedo boats, and, eventually, battleships, along our coasts by intracoastal canals is most important would never be denied. That this time will come at a not too distant future seems evident to the writer. All the canals that the commercial interests finally bring to us may not be able to float a battleship; but that will not be necessary, though the Cape Cod Canal should be able to do so. But all the canals will probably be able to pass submarines and torpedo-boat destroyers, and they are bound always to remain our weakest units. Such ability in war time would be a feature so disturbing to a hostile commander on our coast that he would never feel certain that he was not in danger of a night attack by every minor craft that we possessed. The need of keeping his forces concentrated, or of an enormously superior force, is self-evident.

Furthermore, the question of a blockade of our coast would become immensely more difficult to a hostile commander with the canals built. The connecting of the ports of Boston and New York by the Cape Cod Canal makes the first link in the chain, and one

which will accomplish more than the building of any other link. History shows that the successful blockade of individual ports is difficult enough, but when this extends itself to the blockade of 500 miles of coast line, it becomes a task such that we may well accept the opinion expressed in the report of the Special Board of Engineer Officers, U. S. Army, as to these canals, H. R. Document, No. 391, 1912, that the United States will have an "advantage which would make impossible an effective blockade of any one of these ports," *i. e.*, from Boston to the Capes of the Chesapeake.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A HALF CENTURY OF NAVAL ADMINISTRATION IN AMERICA, 1861-1911

By CHARLES OSCAR PAULLIN

XII

THE NAVY, 1897-1911

SECTION I. PERSONNEL

For several years immediately preceding the war with Spain, the navy and the department gave much consideration to the naval personnel, the condition of which had become very unsatisfactory, and many attempts were made to obtain remedial legislation of various sorts. There was not a corps in the navy that did not believe that it suffered from some hardship. The especial grievance of the line officers was the infrequency of promotions. Some of the lieutenants had spent more than 20 years in their grade, and in 1898 a few officers were still lieutenants who had entered the navy as midshipmen during or immediately after the Civil War. Several lieutenants were between 40 and 50 years of age. This long service in the lower ranks worked an injustice to the officers, and was detrimental to the navy since it unfitted the officers for command ranks. Men who had spent the best years of their lives in subordinate stations, occupied often with trifling and routine tasks, were not likely to have the executive habit, initiative, decision and resourcefulness, when having passed the meridian of life they became captains, commodores and rear admirals. Moreover, the existing system rushed the officers through the upper grades so rapidly that they were able to acquire but little experience in them.

The causes of the dearth of promotions in the nineties were both chronic and acute. Owing to the small number of officers in the higher grades as compared with the large number in the lower, the normal operation of a system of promotions based on

seniority results in the slow movement of the officers from rank to rank in the lower grades, and the arrival of an officer at the command ranks late in his naval career—far later than the good of the navy requires. This was the chronic cause of the stagnation of promotions. The acute cause dated from the Civil War. Under a system of promotion by seniority, if at any time the movement from grade to grade is abnormally accelerated, then at some subsequent period it will be unduly retarded. During and immediately after the Civil War, the number of promotions was greatly increased, and many young men were rapidly advanced. By 1890 this had resulted in placing in the higher ranks many officers who were still some years below the retiring age of 62 years, and who blocked the movement of all below them. Moreover, since an unusually large number of officers entered the navy about the time of the Civil War, considerable inequalities in rank arose when these men began to reach the higher grades. The officers of the date of the Civil War were sufficient in number to fill all the grades above, and part of, the lieutenant's grade. It seemed unfair to lieutenants of the date of 1861-1865 to see their fellow-officers of the same date filling the positions of commodore and rear admiral.

By 1897 the differences between the line officers and the engineers engaged the attention of the department even more than the evils of infrequent promotions. The origin of this controversy dates from the establishment of the engineer corps in 1842. Differences in the origin, history and traditions of the corps naturally led to jealousies and misunderstandings. Moreover, the development of steam power, machinery and engineering on board naval ships had for half a century gradually and continually enhanced the importance of the engineer corps, which had correspondingly increased in importance, risen in rank and in the education of its officers, and grown in dignity and consideration. In some respects, however, the enhancement of the position of the engineers did not appear to them commensurate with the importance they had attained in the economy of modern ships. In 1897 the chief controversy between them and the line related to their demand for certain rights and privileges which were enjoyed by the line and which the line was unwilling to share with them. Speaking generally, one may say that the engineers were asking for an increase of numbers, positive rank, "naval"

titles, greater recognition, and absolute command over their own divisions aboard ship.

In the first year of Secretary Long's administration, the strife between the line and the engineers became a matter of much importance and solicitude, and both the Navy Department and Congress determined to make another attempt to restore harmony. The civilian engineers espoused the cause of their professional brethren within the navy, and demanded that they be given a higher standing and recognition. Long decided to refer the questions at issue to a board of experienced men. Accordingly, on November 4, 1898, he appointed the Naval Personnel Board, consisting of Assistant Secretary of the Navy Roosevelt, president, and nine naval officers, five of the line and four of the staff, and directed it to "consider the matter of a reorganization of the personnel of the navy," and to embody its conclusions in a report and a bill. The principal representatives of the line were Captains A. S. Crowninshield, W. T. Sampson and R. D. Evans; and of the staff, Engineer in Chief G. W. Melville and Chief Engineer Charles W. Rae. The board held sessions and deliberated over its problems for some four weeks. At one of its first meetings Engineer in Chief Melville submitted a proposition in behalf of the engineers conceding most of their demands. This was rejected. Captain Evans then proposed a plan which involved the abolition of the engineer corps and the amalgamation of the engineers with the line officers. Mr. Ira N. Hollis, professor of engineering in Harvard University and a graduate of the Naval Academy, had suggested this solution in the summer of 1897, and Assistant Secretary Roosevelt had become its able champion. Animated by a strong desire to promote the harmony of the navy, the board finally agreed to recommend the amalgamation of the two corps, notwithstanding some of the members had misgivings respecting the efficacy of this remedy.

The report of the board was written by Roosevelt, who spiritedly advocated the amalgamation of the two corps. One argument for it he based upon an analogy between the conditions of the naval service 250 years ago and those of to-day. The two principal corps of officers on board the naval ships of the seventeenth century were those of the sailormen and the sea-soldiers. The sailormen, who had charge of the motive power and sailed the ship, may be said to correspond to the engineers of to-day. The

sea-soldiers, who fought the ship, had duties analogous to those of the modern line officers. Just as the sailormen and the sea-soldiers were finally merged into one naval corps, a similar merger or amalgamation must take place between the engineers and the line. Another argument of Roosevelt was based upon the similarity of the duties of the two corps. The work of both classes of officers on shipboard, he said, was now largely of an engineering character, and for its proper performance it required officers possessed of a considerable knowledge of engineering. "Every officer on a modern war vessel in reality has to be an engineer whether he wants to or not. Everything on such a vessel goes by machinery, and every officer, whether dealing with the turrets or the engine room, has to do with engineers' work. There is no longer any reason for having a separate body of engineers responsible for only a part of the machinery. What is needed is one homogeneous body, all of whose members are trained for the efficient performance of the duties of the modern line officer. The midshipmen will be grounded in all these duties at Annapolis, and will be perfected likewise in all of them by actual work after graduation. We are not making a revolution; we are merely recognizing and giving shape to an evolution, which has come slowly but surely and naturally, and we propose to reorganize the navy along the lines indicated by the course of evolution itself."

The Naval Personnel Board also recommended a plan for increasing the number of promotions in the navy, according to which the weak and incapacitated officers of the lower grades were to be selected for retirement by a naval board, each member of which was to take an oath to act without prejudice and impartiality. The Assistant Secretary of the Navy vigorously condemned the system of promotion by seniority. He said that it made the "promotion of an officer dependent not upon the zealous performance of his duties but upon the possession of a good stomach and of an easy nature; while a positive premium is put upon the man who never ventures to take a risk, and who therefore never does anything great." Several minor reforms were also proposed. The board embodied its recommendations in a bill, which Secretary Long on January 12, 1898, after suggesting a few slight modifications, transmitted to Congress, earnestly recommending its passage. In the spring of 1898 the House Committee on Naval Affairs thoroughly considered the amalgamation of

the two corps, holding lengthy hearings on the subject and calling before it Assistant Secretary Roosevelt and many leading naval officers. On May 19 it reported a bill, based upon the recommendations of the board, but containing some new provisions. Owing to the distractions of the war with Spain, consideration of this measure was postponed. In January, 1899, the naval personnel bill was again taken up by Congress, and after being debated, amended and passed by both Houses, was signed by President McKinley on March 3, 1899.[257]

The Naval Personnel Act contained the most important legislation concerning the officers of the navy that had been passed since the Civil War. Its most noteworthy provisions related to the amalgamation of the line officers and the engineers, naval pay and rank, the number of officers, the flow of promotions, the enlistment and retirement of seamen, the establishment of a corps of warrant machinists, and the marine corps. The first section of the act was the most important one, and the most far-reaching in its effect upon the navy. It provided that the "officers constituting the engineer corps of the navy be, and are hereby transferred to the line of the navy, and shall be commissioned accordingly." The engineers were divided into three classes; those above the rank of commander, who were to have shore-duty only; the older officers below this rank, who were given the option of assuming line or retaining engineering duties; and the younger officers, who were to perform line duties. All engineers who were assigned to line duties had first to qualify for them by passing an appropriate examination. One hundred warrant machinists, who were to take the place of the engineers in the engine rooms, were authorized. To make room in the line for the engineers, its numbers in the various grades were considerably increased.

One of the most popular provisions of the act was that which increased the pay of officers, and which tended to neutralize the opposition to amalgamation. The pay and allowances of the officers of the line, the medical corps, and the pay corps were made to correspond to the pay and allowance of the army officers of corresponding ranks. The sea-pay of the first nine rear admirals was

[257] Sen. Doc., 55C. 2S., No. 116; House Doc., 55C. 2S., No. 1375; Long, New American Navy, I, 81-88; Army and Navy Journal, XXXIV, 952, 962; Atlantic Monthly, LXXX, 318-319; Congressional Record, XXXII, 658, 1974.

fixed at $7500; of the second nine rear admirals, $5500; of a captain, $3500; and of a lieutenant, $1800. All officers below the rank of rear admiral were allowed "longevity pay," that is, an increase of pay of ten per cent for each five years of service. In order to discourage shore-duty, the pay of officers on shore was placed 15 per cent below the pay of those at sea. The act also gave positive rank to all staff officers who by statute were given relative rank. The number of naval constructors was increased to 40, and this corps was given positive rank. The number of officers in the marine corps was considerably increased, and its enlisted force was raised to 6000 men. The grade of commodore was abolished. The length of the term of enlistment of all seamen was made four years.

The Naval Personnel Act also contained a provision for accelerating the flow of promotions. The Secretary of the Navy was authorized to keep a list of "applicants for voluntary retirement." In case the number of vacancies for each year in certain specified grades did not equal certain specified numbers, the President was authorized to select from the list of applicants the requisite number of officers and retire them. If it should happen that the specified number of vacancies could not be created in this way, the Secretary of the Navy was empowered to convene a board, which was to select the required number of officers for retirement. All officers who were thus retired either voluntarily or involuntarily were granted three-fourths of the pay of the next higher grade, a provision which was popular with the officers, but which did not meet the sanction of Secretary Long, who believed that it placed a premium on retirement.[258]

Respecting the advisability of amalgamation, the officers of the navy were by no means a unit. Some of the older officers, who strongly opposed amalgamation, argued that it was contrary to the prevailing tendency of the times, specialization, and that it would make the line officer a jack-of-all-trades. Moreover, according to them, there was needed on board the naval ships a thoroughly trained corps of engineers, and its place could not be taken by a corps of warrant machinists.

The passage of the act proved to be one thing, and its enforcement quite another. In its passage the engineers seem to have

[258] Long, New American Navy, I, 86; U. S. Statutes at Large, XXX, 1004-1009.

scored, but the line has for the most part interpreted it. The act apparently contemplated the assignment of young officers to line and engineering duties indiscriminately. In practice, however, only a few of them were given the duties of engineers. As a result, there arose a lamentable dearth of officers of engineering experience. The young officers of the line did not seriously take up the study or practice of their new duties. The chief of the Bureau of Steam Engineering in his annual report for 1905 said that the "situation is critical and something must be done." He recommended the assigning of engineering duties to the young line officers, and the establishment of a corps of engineering specialists within the line. There was at this time considerable sentiment in the navy favorable to the revival of the engineer corps. Secretary Bonaparte, however, was of the opinion that by a thoroughgoing and persevering enforcement of the Naval Personnel Act a satisfactory engineering service at sea might be provided, and that a reversal of the policy of amalgamation would cause "embarrassment and an impairment of confidence in the department, both within and without the service."[259] By 1910, if we may judge from the reports of the Secretary of the Navy and of the chief of the Bureau of Steam Engineering, the new system was working satisfactorily. The Secretary reported that the line officers compared favorably as operating engineers with the officers of the old engineer corps. A body of engineering experts drawn from the line was receiving training in a school of post-graduate work in marine engineering, at Annapolis.[260]

Notwithstanding the provisions of the Naval Personnel Act respecting the retirement of officers, they still reach the flag or command ranks late in their naval careers. In recent years the chiefs of the Bureau of Navigation have given much attention to this evil, and have proposed various remedies. In 1904 Secretary Morton, following the bureau's suggestions, recommended that captains be retired at 60 years of age and commanders at 55 years, and that the age of retirement for captains be gradually reduced to 55 and that of commanders to 50 years. By this means the flow of promotions would be accelerated and officers

[259] Army and Navy Journal, XXXIX, 286; Ann. Rept. of Sec. of N., 1905, pp. 6-8; Ann. Rept. of Chief of Bureau of Steam Engineering, 1905, pp. 31-34.

[260] Ann. Rept. of Sec. of N., 1910, pp. 26, 489.

would be brought to the command ranks at earlier ages. Secretary Bonaparte, however, was opposed to this plan, believing that an officer's fitness for command diminishes little between his fortieth and sixtieth year. In place of it, he recommended a quite novel and radical measure, according to which every officer after serving five years in any grade should be either promoted, dropped or retired. A personnel board, of which Assistant Secretary Newberry was president, was appointed by Bonaparte in August, 1906. It recommended the adoption of a system of promotion fixing more or less definitely the time the officers should spend in each grade, and eliminating from the navy all officers in excess of the required numbers for each grade. President Roosevelt has always been inclined to attack the problem chiefly from "below." He would increase the number of promotions by advancing the fit officers of the lower grades and removing from the service the unfit. That is, he would introduce the system of promotion by selection.[261] The subjects of promotion, rank and amalgamation are still under discussion. In 1911 the department favored a method of promotion that would bring officers to flag rank at an earlier age, the creation of the ranks of admiral and vice admiral, and the amalgamation of the construction corps and the pay corps with the line.[262]

The rapid growth of the commissioned fleet since 1898 has necessitated considerable increases in the number of officers in every naval corps, except those of chaplain and professor of mathematics. Secretary Bonaparte, indeed, has recommended an increase in the number of chaplains. The enlargement of the naval personnel, however, has by no means kept pace with the needs of the service, and for several years the navy has been crippled for want of officers. In 1902 President Roosevelt said that a thousand additional officers were required. In 1904 the chief of the Bureau of Navigation showed that, in order to man adequately the ships already built and building, the number of line officers would need to be doubled. His estimate called for 2078 line officers from the grade of midshipman to that of captain.[263] In 1911 the number of line officers on the active list from

[261] Ann. Rept. of Sec. of N., 1904, pp. 8-9; 1905, pp. 4-6; Ann. Message of President, 1905.

[262] Ann. Rept. of Sec. of N., 1911, pp. 47-49.

[263] Ann. Message of President, 1902; Ann. Rept. of Sec. of N., 1904, p. 473.

midshipman-at-sea to admiral was 1629; on the retired list, 434. In order to meet the future demands of the navy for officers, Congress has greatly increased the number of midshipmen at the Naval Academy. This number rose from 280 in 1899, to 879 in 1906. The yearly appointment of 12 ensigns from the warrant officers of the navy is now permitted.

To the request of the Navy Department for more officers, Congress at times replied that the deficiency could be considerably reduced by sending more of them to sea. To this the department rejoined that additional officers were required on shore as well as on board the naval vessels, and that one reason for the high efficiency of the American navy was the training which its officers received in the administrative posts of the navy yards and the department. Congress was inclined to exaggerate the number of officers employed on shore and the evils of shore-duty. In January, 1901, the chief of the Bureau of Navigation reported that 76 per cent of the younger, and 40 to 50 per cent of the older officers were at sea. The tendency during the decade 1897-1907 was to exalt the chief function of the naval officer, the command of ships. President Roosevelt, who would discourage long details to shore-duty, said in his first annual message that the "officers and men alike should be kept as much as possible on blue water, for it is there only they can learn their duties as they should be learned." [264]

During the last decade the educational facilities of the navy have been greatly improved. For many years the Naval Academy at Annapolis was neglected. Finally some of its buildings became so dilapidated and insecure that they were a disgrace to the nation. In 1898 Congress made a liberal appropriation for new buildings, in 1900 it authorized the reconstruction of the academy at a cost of $8,000,000, and later it raised this sum to $10,000,000. By 1907 the work of reconstruction was nearing completion. In 1897 a postgraduate course in naval construction was established at the academy, but two years later this was discontinued, and the members of this corps were sent to the Massachusetts Institute of Technology for advanced technical instruction. In 1902 Secretary Long gave orders for the establishment at Annapolis of a postgraduate course in engineering for the purpose of

[264] Congressional Record, XXXIII, 5224, 5267; XXXIV, 1355, 2130; Ann. Message of President, 1901.

instructing the junior line officers in engineering duties, which, under the Naval Personnel Act, they were to assume on shipboard. In May, 1903, the school of application of the marine corps was transferred from the marine barracks at Washington to the Naval Academy at Annapolis. In 1902 the school for naval surgeons was located in Washington, and greatly strengthened, and a little later a school for the assistant paymasters of the navy was established.

In recent years the training of officers at sea in fleet maneuvers and practical drills of various kinds has been much extended and improved, and to enhance the value of these exercises a policy of concentration of the fleets has been followed. In the winter of 1904-1905 the European and South Atlantic squadrons were consolidated with the North Atlantic squadron, and early in 1907 the Pacific and Asiatic squadrons were brought together under one command. In that year the Atlantic fleet consisted of 43 vessels and was divided into four squadrons. The Pacific fleet, which was made up of three squadrons and the first and fourth torpedo flotillas, contained 35 vessels. In 1910 the Asiatic squadron was reestablished.

In 1911 the marine corps contained 322 commissioned officers on the active list, ranking from major general to second lieutenant, and 62 officers on the retired list. From 1898 to 1910 the enlisted personnel increased from 2600 men to 9267.[265] The commandant in 1911 was Major General W. P. Biddle. He was assisted in administering the corps by 21 officers, belonging to the adjutant and inspector's department, quartermaster's department and paymaster's department. The headquarters of the marine corps are at Washington, D. C. Marine barracks are maintained near the chief navy yards in the United States and at Annapolis, Port Royal, New Orleans and Sitka, and in Porto Rico, Hawaii, Guam and the Philippines. Marines are stationed in Cuba and Panama and at Peking. In 1910 the advanced base school of the marine corps was established at New London, Connecticut. A school for officers is maintained at Port Royal, South Carolina. While recognizing the efficient service of the corps in the past, many naval officers have from time to time favored its abolition,

[265] Navy List, July, 1905; Jan., 1912; Ann. Rept. of Sec. of N., 1910, p. 813.

a step which is urged in order to render the organization of the navy more homogeneous.

The number of seamen to be trained, and their need of a better and more highly specialized training, have grown with the growth of the fleet and the development of naval construction. In 1898 the authorized strength of the enlisted force of the navy was fixed at 13,750; in 1899, at 20,000; in 1901, at 25,050; in 1902, at 28,000; in 1903, at 31,000; in 1904, at 34,000; in 1905, at 37,000; in 1907, at 38,500; in 1909, at 42,000 and in 1911, at 44,000.[266] To enlist and train these seamen for the naval service has been a task of considerable magnitude. Owing to the small number of professional seamen in the United States and the difficulties in the way of procuring landsmen, the mere enlisting of the requisite numbers has taken much work and time. In 1905 recruiting was conducted at the various receiving ships at coast ports, at permanent recruiting stations at Boston, New York, Buffalo, Philadelphia, Baltimore, Chicago and San Francisco, and by four recruiting parties in the field which covered practically the entire continental limits of the United States. The whole country was scoured for recruits. Only about one-third of the men who presented themselves for enlistment were able to pass the prescribed examination. The total number of men enlisted in 1911 was 14,756. During the last few years the navy has suffered greatly from want of seamen. In 1902 President Roosevelt wrote that "serious trouble threatens us if we cannot do better than we are now doing as regards securing the services of a sufficient number of the highest type of sailormen, of sea mechanics." In December, 1906, the navy was about 4500 men short of its authorized strength.[267]

The facilities for training seamen and landsmen in the naval arts have been greatly enlarged. Important improvements have been made in the naval training station at Newport, notably by the erection of barracks for the accommodation of 2000 recruits. In April, 1896, Congress passed an act establishing a training station for the Pacific coast on the island of Yerba Buena in the harbor of San Francisco, and on April 12, 1898, 140 acres of land was

[266] Congressional Record, XXXVIII, 2721; U. S. Statutes at Large, XXXIII, 1092; XXXV, 753; XXXVI, 1266.

[267] Ann. Rept. of Chief of Bureau of Navigation, 1905, pp. 15-16; Ann. Message of President, 1902.

acquired for that purpose by transfer from the War Department. This has been improved by grading and the erection of barracks, officers' quarters and other necessary buildings, and accommodations for 600 apprentices have been provided. In 1902 the establishment of a training station on the Great Lakes was determined upon, and accordingly on April 27, 1904, Congress appropriated $250,000, and directed that a board of three members should select a site. After viewing various proposed locations, the board chose a site at Lake Bluff, on Lake Michigan, a few miles north of Chicago. Most extensive improvements have been made there, and they are now nearing completion.

Soon after the war with Spain the policy of enlisting and training landsmen was inaugurated, since in no other way could the ever-increasing demand for recruits be met. In the fiscal year 1901, 4198 landsmen were enlisted, chiefly in the Mississippi valley and to the eastward thereof. The landsmen are given a training similar to that of the apprentices, and in 1901 seven training vessels were thus employed. Port Royal, South Carolina, was first assigned as the training station for landsmen, but it was soon abandoned and Norfolk was selected. The ships *Richmond* and *Franklin*, with accommodations for 1000 men were attached to the station. On the Pacific coast the landsmen are trained at the San Francisco training station. Until 1904 the training systems for boys and landsmen were distinct from each other, but in December of that year, in accordance with the recommendations of the Bureau of Navigation, they were united, and the training ships were retired from service. After the seamen apprentices, whether boys or landsmen, receive four months' instruction at one of the training stations, and after they pass an appropriate examination at the end of this course, they are rated as ordinary seamen and transferred to the regular cruising vessels of the navy. The new system needs fewer officers and sailors for its operation, since none are required for training ships, and it secures for the regular navy the services of the apprentice seamen in a comparatively short time after their enlistment. As a method of training apprentices it is probably less effective than the old system, but it causes a saving of officers and seamen, a consideration that led to its adoption.[268]

[268] Ann. Rept. of Chief of Bureau of Navigation, 1905, pp. 12-13.

In recent years the special training of seamen in gunnery has been greatly improved. For the seamen-gunner class of the navy, a four months' course of instruction in constructing and mounting guns and in lathe and machine work is given at the Naval Gun Factory at Washington, and a six months' course in torpedoes, submarine mines and diving, at the Naval Torpedo Station at Newport. For several years gun captains were trained on board the *Amphitrite*. Special training is provided for the crews of the submarine boats. Since the war of 1898 training in gunnery and target practice has been a special feature of the work of the cruising ships. President Roosevelt insisted that these most essential drills should not be neglected. Small-arm target ranges and target galleries have been established on shore at all training stations, at various naval stations and navy yards and near the receiving ships. In his annual message for 1904 the President said that the markmanship of the navy had improved in a remarkable degree.

In 1898 a school for the training and instruction of the enlisted men in electricity was established at the Boston yard, and during the succeeding year similar schools were started at the New York and Mare Island yards. In 1900 the Boston school was discontinued. The course of instruction at the New York and Mare Island schools covers a period of five months, and is pursued either by professional electricians or by men who have had experience in handling electrical apparatus aboard ship. Instruction is given in electrical science, the handling of electrical machinery, and wireless telegraphy. During 1905 120 men completed the electrical courses. About 1902 an artificers' school for the instruction of carpenters' mates, shipwrights, blacksmiths, coppersmiths, painters and ship-fitters was established at the Norfolk yard, and was placed under the supervision of a commissioned officer of the navy, who was assisted by warrant officers and the leading mechanics of the Norfolk yard. The course of instruction covered a period of three months. Schools for petty officers belonging to other than the artificers' branch of the service are maintained at the Newport training station and at the New York navy yard. Schools for yeomen have been established at the New York and Mare Island yards. Under Secretary Long a training school for firemen was organized on board the U. S. S. *Cincinnati*, and a school for the training of bandsmen has been recently opened.

These various schools and means of instruction have greatly enhanced the efficiency of the sailorman. They have specialized his training to meet new naval needs, and have enabled him to use and understand the complicated machinery with which ships are now fitted. He is coming to know less and less about sails, and more and more about machines. The old training in "marlinspike seamanship" is yielding to a new training which follows the lines of recent naval developments. The bluff, jolly, illiterate, profane and picturesque man-of-war's men of the old school is disappearing. The newcomers are men of better morals, more booklearning, and more specialized skill, though less indigenous to the sea and more likely to abandon a seafaring life. An excellent class of seamen is being obtained from the interior of the United States, and the number of citizen-sailors is increasing. When Secretary Long entered the Navy Department in 1897, almost 25 per cent of the enlisted force were foreigners. In 1904 only 9 per cent were foreigners, 11 per cent were naturalized citizens, and 80 per cent were natives of this country. The introduction into the navy of men from the interior states, who have little or no knowledge of the trials and hardships of a seafaring life, has doubtless increased the number of deserters. The percentage of desertions for the fiscal year 1904 was 15.6.[269]

The large increases in the number of officers and seamen in the navy during the last decade has necessitated a large increase in the "pay of the navy." The appropriations under this head for 1898 amounted to $8,235,385, and 1911, to $35,000,000. This was an increase in 13 years of more than 300 per cent. During the period 1881-1897, when the first vessels of the new navy were constructed, the average sum carried by the annual naval appropriation bills was $21,000,000. The naval appropriation bill for 1897 carried, in round numbers, $31,000,000; for 1901, $61,000,000; for 1905, $98,000,000; and for 1910, when they reached their maximum, $137,000,000. That is, the naval appropriations more than trebled in eight years and more than quadrupled in 13. Than annual appropriations for the navy during the Civil War were $73,000,000. The appropriations for the repair and improvement of navy yards and docks increased from $1,515,000 in 1897 to $8,714,000 in 1901. The estimates of the department

[269] Long, New American Navy, I, 92; Ann. Rept. of Sec. of N., 1904, p. 499.

for these purposes for 1903 amounted to $21,566,000. For 1906 these appropriations were only $3,140,000. The appropriations for new ships, including the cost of hull, machinery, armor, armament and equipment, increased from $11,479,000 in 1897, to $32,177,000 in 1905. The total appropriations for new ships for 1906, including deficiencies, amounted to the remarkable sum of $55,356,000. The naval appropriations for 1912 were $129,000,000.[270]

[270] U. S. Statutes at Large, XXIX, 648-649; XXXIII, pt. 1, 1092; Congressional Record, XXXVIII, 2079; XXXIX, 2567, 2580; Ann. Rept. of Sec. of N., 1904, p. 54; 1905, pp. 48-49; 1910, p. 57; 1912, p. 157; Proc. of U. S. Naval Inst., XXVIII, 56; House Rept., 56C. 1S. and 2S., No. 905, 26, table; Congressional Record, XXXIX, 3484-3485, 3490.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE MILITARY-INDUSTRIAL ORGANIZATION OF THE NAVY

By Lieut. Commander Thomas A. Kearney, U. S. Navy

To the student of industrial organization, the practical man, the graduate engineer, and to those interested in the management of our great corporations, the navy of the United States affords an excellent and profitable field of study.

Few, indeed, realize the magnitude and importance of the military-industrial organization that in its constant active operation maintains the efficiency and material readiness of the fighting fleet.

The navy as an organization may, with propriety, be likened to a vast corporation, having an invested capital of several billion dollars; an annual expense account of more than $140,000,000; a sea-keeping personnel of about 60,000 officers and men; and requiring the direct employment of no less than 35,000 laborers and skilled artisans from practically every known trade and calling.

It exists through the will of the people, and like the other branches of the general government, is for the people and by the people, and dependent upon the Congress.

That there may be no confusion of ideas one needs must accept as axiomatic, that the navy as an entity exists primarily, and is at all times a military organization. The authority and responsibility of the leaders; the exacted and implicit subordination of its personnel to those placed in authority over them; its activities; its years of combined and painstaking effort, have but one predominating purpose. So, too, its construction and engineering; its maintenance and procurement of stores and ammunition; the equipment and activities of its navy yards and naval stations—all focus as the radii of a circle to a common center, and that

center, in the briefest possible summation, is the military readiness of its personnel and material for war!

That such an idea is repugnant and unacceptable to those who fanatically worship at the shrine of the goddess of peace, or to the more utilitarian few who would clutter the decks of fighting ships with the goods and samples of our manufactured or commercial products, is of itself unfortunate. Crediting them with all sincerity in their "isms," one can but plead in passing that they be enlightened, for they know not what they do.

The military feature of the navy needs no exploitation at this time. Its history and traditions are replete with deeds of daring and valorous accomplishment. The reviews, cruises, and periodic visits of the ships of the fleet to our seaports, together with the occasional furlough trips of officers and men to the interior towns give a certain desired publicity and a degree of familiarity with this most important phase of the subject.

The purposes of the navy as a military part of the federal government are essentially twofold—defensive in time of peace; aggressively offensive in time of war. The potentiality of its strength, and its mobility are, in time of peace, an assurance of continued peace. In time of war it becomes instantly an active outer barrier against invasion and reprisal. It is, in truth, the strong right arm of the national defence and offence.

Inseparably associated with these military features—a tangible, integral and coherent part thereof—is the industrial organization. Like unto the human body, the navy is a living organism, taking in from several sources such material as may be required for its sustenance; deriving its life, its strength and physical activity only through the assimilation of this material, and attaining to its maximum efficiency only when directed by a controlling mind, functioning through certain centers, capable of coordinating the efforts of its entire being.

Admitting the codependence of mind and body, so, too, must we recognize the intimacy of union between the military and the industrial organizations of the navy. Divorcement, or even partial separation of the one from the other is impracticable and must be resisted by those having the best interests, not only of the navy, but of the country as a whole, at heart. There should be no separation of the material navy from its personnel.

Knowing that the value of an analogy is directly dependent upon the similarity of the subjects compared, one cannot help but be impressed with the fact that the human organism, whether it be considered as an organization, a machine, or the coordinated union of many parts, lends itself to multitudinous comparisons.

The peculiar value of analogy is that by it certain cases, in which relations are clear and conspicuous, are used to familiarize the mind with the nature of the relation, so that when similar phenomena, differently grouped are studied, we are able to detect the relationship, even though it be subtle and partly hidden in its new form.—PROFESSOR EDW. D. JONES.

One cannot in the strictness of an analogy "substitute men for cells, and the nation for the human body" for the mere purpose of emphasizing group specialization. The comparison should, in fairness, be carried further and along broader lines. No organ or group of cells in the human body remains animate once the soul has fled. It is equally illogical to speak of the creation of an industrial organization under the control of a semi-military industrial corps. Candidly, I must confess my inability to picture a semi-military corps. By derivation and definition one may readily define and understand both words, but in the hyphenating process one pauses in wonderment, puzzled whether to make the legs military by encasing them in puttees; or the head, by placing thereon a visored cap with a hammer rampant on a metal plate. Military-semi might be applied to a holster without a pistol, or a scabbard with a sword that cannot be drawn.

THE NAVY DEPARTMENT

The Navy Department is a separate and distinctive branch of the federal government.

There shall be at the seat of Government an executive department to be known as the Department of the Navy, and a Secretary of the Navy, who shall be the head thereof (Sec. 415, Revised Statutes).

The definition of its duties have been coincident and commensurate with the growth of the nation. Under the direct control of the Secretary the several activities of the department have been grouped in four coequal divisions known, respectively, as the divisions of: (a) Operations, (b) Personnel, (c) Material, (d) Inspections. These names are fairly indicative of the duties and

functions of each division; that is to say, the Division of Operations moves and operates the fleet and its train; Personnel provides officers and men; Material builds the ships, provides the stores and munitions, maintains repair yards, docks and fuel stations; Inspections examines into and reports upon the existing conditions ashore and afloat.

The business of the department has, from time to time, been distributed, in such manner as the various Secretaries have judged to be proper and expedient, among the following bureaus:

(a) Bureau of Yards and Docks.
(b) Bureau of Equipment.
(c) Bureau of Navigation.
(d) Bureau of Ordnance.
(e) Bureau of Construction and Repair.
(f) Bureau of Steam Engineering.
(g) Bureau of Supplies and Accounts.
(h) Bureau of Medicine and Surgery.

This allocation forms the basis of the present administrative plan.

In detail, we find that the Secretary has as a personal advisory council certain aids; that two of the four grand divisions are made up of the bureaus just enumerated; that each bureau is presided over by a chief, selected from the commissioned personnel of the navy, nominated by the President, confirmed by the Senate, and appointed for a period of four years; and, that in addition, the General Board and the Naval War College act as deliberative and advisory bodies in the broad and comprehensive sense of the words.

DIVISION OF MATERIAL

Confining ourselves, for the purposes of this article, to the material military-industrial features of the navy, we find that they readily group themselves in the Division of Material and that its functions are exercised through the coordinated efforts of its component bureaus.

Graphically shown this division is large even beyond our ordinary conception and understanding. Financially, it is the most important of all divisions. It includes:

(a) *The Bureau of Yards and Docks.*—This bureau is responsible for the design and construction of the public works and

public utilities of the navy, and in general, with their repair, upkeep and operation. The term "public works" is construed by regulation to include the following and similar works of whatever character and wherever located subject to certain definite exceptions, and except such as may be located on board ship: aqueducts; breakwaters; bridges; buildings and permanent fixtures; canals; casemates; chimneys; cisterns; coaling plants; conductors for heat, air, light, power, steam, water and communicating systems; conduits for pipes and conductors; dams; dikes; ditching; dredging; docks; drydocks and machinery thereof; earthworks; fences; flagpoles; grading; harbor work; heating and ventilating plants; hospitals; industrial offices; landings; lawns; magazines; paving; piers; pipe lines; pole lines; power plants and the machinery thereof; quay walls; radio stations on shore, including buildings and masts, but not equipment on its installation; railways; marine railways; recreation grounds; refrigeration plants; reservoirs; roads; sewers; shade trees; slips; building slips; smokestacks; storage tanks; target ranges on shore; walks; walls, water works and wharves. The term "public utilities" is construed by regulations to include the following and similar utilities of whatever character and wherever located with certain definite exceptions, and except such as may be located on board ships: Awnings, cranes outside of shops; derricks outside of shops; dredges; fire apparatus; fixed moorings; flags; landing floats; locomotives and rolling stock; mules, horses, and cattle; pile drivers; shears, steam shovels; telephone and telegraph lines; trucks; vehicles; wheels.

(b) *The Bureau of Equipment.*[1]—This bureau is responsible for the procurement and delivery of coal and water for all purposes on board naval vessels; for the upkeep and operation of all coaling plants; for the manufacture of anchors, cables, the supplying and fitting of rope, cordage, rigging, sails, awnings and other canvas, flags, bunting, galley fittings and outfits. It has cognizance over the entire system of interior communications; designs supplies, installs, maintains and repairs all means of in-

[1] The duties originally assigned by law to this bureau have recently been distributed among the other bureaus and offices of the Navy Department; for the purpose of this text they are given as originally assigned although some are of a non-material character.

terior and exterior electrical communications, excepting ordnance transmitters and indicators, and of all electrical appliances of whatsoever nature on board naval vessels, except motors and their controlling apparatus used to operate the machinery belonging to other bureaus. It is charged with the upkeep and operation of the Hydrographic Office, the Naval Observatory, the Compass Office and the Nautical Almanac; the publication and supply of charts, nautical works, and sailing directions; the dissemination of nautical, hydrographic, and meteorological information to the navy and the mercantile marine, the supply of navigational outfits; and the making of ocean and lake surveys.

(c) *The Bureau of Ordnance.*—The duties of this bureau comprise all that relates to the upkeep, repair, and operation of the Torpedo Station at Newport, R. I.; the Naval Proving Ground at Indian Head, Md.; the Naval Gun Factory at Washington, D. C.; magazines on shore; to the manufacture of offensive and defensive arms and apparatus (including torpedoes and armor), and all ammunition. It determines the interior dimensions of revolving turrets and their requirements as regards rotation; designs and constructs all turret ammunition hoists; determines the requirements of all ammunition hoists and the method of construction of armories and ammunition rooms on board ship; installs all parts of the armament and its accessories not permanently attached to any portion of the structure of the hull of the vessel, excepting turret guns, turret mounts, and ammunition hoists, and such other mounts as require simultaneous structural work in connection with installation or removal.

It has cognizance over all electrically operated ammunition hoists, rammers, and gun elevating gear in turrets of electric training and elevating gear for gun mounts not in turrets; of electrically operated air compressors for charging torpedoes; and of all range finders, and battle order and range transmitters and indicators.

(d) *The Bureau of Construction and Repair.*—The duties of this bureau comprise the responsibility for the structural strength and stability of all ships built for the navy; all that relates to the design, building, fitting and repairing of the hulls of ships, turrets, spars, capstans, windlasses, steering gear and ventilating apparatus; care and preservation of ships not in commission; docking and

undocking of ships, and the operation of drydocks. It designs, constructs and installs, after consultation with and to the satisfaction of the Bureau of Ordnance, independent ammunition hoists, and the permanent fixtures of the armament and its accessories as manufactured and supplied by that bureau. It is responsible for the placing and securing of armor once the material, quality and distribution of thickness have been definitely determined. It has cognizance over all electric turret-turning machinery, the same to conform to the requirements of the Bureau of Ordnance as to power, speed and control. It has cognizance over stationary, electrically-operated fans or blowers for hull ventilation; boat cranes, deck winches, capstans; steering gear and hand pumps not in engine rooms. It maintains the model basin at the navy yard at Washington, D. C.

(e) *The Bureau of Steam Engineering.*—The duties of this bureau comprise all that relates to designing, building, fitting out, and repairing machinery used for the propulsion of naval ships; the steam pumps; steam heaters, distilling apparatus; refrigerating apparatus; all steam connections of ships, and the steam machinery necessary for actuating the apparatus by which turrets are turned. It has supervision and control of the upkeep and operation of the Engineering Experiment Station at Annapolis, Md.

(f) *The Bureau of Supplies and Accounts.*—This bureau is subdivided into two sections, namely, the *Section of Supplies* and the *Section of Accounts.*

The *Section of Supplies* comprises all that relates to the purchase, reception, storage, care, custody, transfer, shipment and issue of all supplies for the naval establishment, and the keeping of property accounts for the same, except supplies for the Marine Corps, and except the reception, storage, care, transfer, property accounts, and issue of medical stores. It requires for, prepares, or manufactures provisions, clothing, and small stores.

The *Section of Accounts* comprises all that relates to the supply of funds for disbursing officers, the payment for articles and services for which contract or agreement has been made by the proper authority, and the keeping of the money accounts in the naval establishment, including accounts of all manufacturing and operating expense at navy yards and naval stations.

(g) *The Director of Navy Yards* is charged with all matters relating to methods of organization and administration of the industrial plants of naval stations, including all matters affecting the method of doing work.

(h) *The Aid for Material* advises the Secretary as to the work of the several bureaus and officers herein enumerated and in all matters concerning the industrial administration and equipment of navy yards and naval stations. It is his duty to assist the Secretary in insuring that all work performed in the Material Division is efficiently and economically done; to advise the Secretary with a view to securing coordination, and to prepare for issue by the Secretary the necessary orders relating to this division; to examine into all reports made by authorized boards or individuals relative to the work of the division, and to recommend such action thereon as may be necessary.

Even a cursory examination of the composition and the varied extent of the duties and responsibilities of the bureau and offices comprising the Material Division, as detailed above, reveals the fact that they are at once both *military* and *industrial*. Separately, certain of their functions might readily be performed as purely industrial efforts, but, inasmuch as these efforts and their resultant product serve their purpose only when harmoniously combined so as to produce the maximum military efficiency of the navy as a fighting machine, it becomes apparent that the lines of demarcation vanish, and that in lieu of separate entities we have a military-industrial organization, a coalescent union that defies separation.

LOCATION OF ADMINISTRATIVE OFFICES

The principal administrative offices of the Division of Material are located in the Navy Department, Washington, D. C., and through its various bureau chiefs, the Director of Navy Yards and the Aid for Material, there is maintained a direct and continuous communication with the Secretary.

From these offices emanate all original orders; the approval of plans and specifications; the subdivision and allotment of funds; and instructions as to the general method, precedence and procedure of undertaking and accomplishing authorized work.

The policy to be followed by the department with relation to any specific national subject, or the naval establishment, having

been enunciated by the Secretary (acting in the more important instances as the direct mouthpiece of the President), the administrative machinery is readily set in motion.

RESPONSIBILITY AND AUTHORITY OF BUREAU CHIEFS

Each bureau chief is the technical and expert adviser of the Secretary in all matters under the cognizance of his particular bureau, and as such is clearly responsible for the soundness of his advice, the accuracy and completeness of his plans, and the efficiency and thoroughness of his executive details.

BUREAU COGNIZANCE AND COORDINATION

From the very nature of the work performed, the necessity of combined ideas, and the desideratum of a harmoniously functioning product, it is quite apparent that the beginning and ending of bureau cognizance must be determinate and susceptible of ready reference and understanding. Coordination of design, mutual adaptability, and the preeminence of the ultimate idea through the subordination of the parts least essential, together with unquestioning loyalty, are requisites that form the very foundation of the working structure.

If these features be ignored in the inception, the combined and finished product fails in the attainment of its purpose. Bureau authority cannot be independent and absolute—the hull must conform to the machinery, even as the machinery must be adaptable to the hull. The design, construction and operation of a vessel of war is essentially a series of compromises, constantly seeking the ideal; the complications and limitations are such that accomplishment seems well nigh impossible, and in the end we accept that which is next best and nearest to our purpose.

METHODS OF PHYSICAL ACCOMPLISHMENT

When eventually an accepted plan, correlated in its parts, has been adopted and has received departmental approval, its physical accomplishment becomes a function

I. Of a navy yard or naval station.

II. Of a private contractor or builder.

III. Of purchase, after competition, in the market.

The military-industrial activities to be found under these three groupings decrease in the order of their naming.

I. Navy yards and naval stations are government institutions under the care and management of naval officers, and as such are subject to military rules and requirements.

II. Contractors and private builders represent a class of civil institutions, independent of an absolute government control, performing in part government work of a military nature and in consequence subject to governmental inspection and supervision through military agents known as superintending or supervising constructors, constructing engineers, inspectors of ordnance and equipment.

III. Purchase in the open markets is the acquisition of standard commercial products, or of articles manufactured in accordance with standard naval specifications.

NAVAL OFFICERS

Inasmuch as the expression "naval officers" has, or will be frequently encountered in this article, it is considered desirable from the standpoint of the lay reader, to inject a few paragraphs descriptive of these officials, and in particular to indicate the fields from which they are drawn, their training and the work that they are professionally called upon to perform.

The officer personnel of the navy is subdivided or classified as follows:

I. COMMISSIONED OFFICERS

(1) Officers of the Line: The admiral; rear-admirals; captains; commanders; lieutenant-commanders; lieutenants; lieutenants, junior grade; and ensigns.

(2) Officers of the Staff Corps:

(a) Medical Corps: medical directors, medical inspectors, surgeons; passed assistant surgeons; assistant surgeons; dental surgeons.

(b) Pay Corps: pay directors; pay inspectors; paymasters; passed assistant paymasters; assistant paymasters;

(c) Chaplains.

(d) Professors of Mathematics.

(e) Construction Corps: naval constructors; assistant naval constructors.

(f) Corps of Civil Engineers: civil engineers; assistant civil engineers.

(3) Warrant Officers who have been commissioned through length of continuous and efficient service.

(4) Officers of the Line and Staff on the retired list.

(5) Officers of the Reserve Corps.

(6) Acting Staff Officers on probation.

II. MIDSHIPMEN UNDER INSTRUCTION AT THE NAVAL ACADEMY

III. WARRANT OFFICERS (warranted but not commissioned)

(1) Boatswains.
(2) Gunners.
(3) Machinists.
(4) Carpenters.
(5) Sailmakers.
(6) Pharmacists.

In addition to the above classes of commissioned and warranted officers, there is what is known as the petty officer class, subdivided as follows:

I. CHIEF PETTY OFFICERS

(1) Seaman Branch	(2) Artificer Branch	(3) Special Branch
(a) Master at Arms.	(a) Machinist's Mates.	(a) Yeomen.
(b) Boatswains Mates.	(b) Electricians.	(b) Hospital Stewards.
(c) Gunners Mates.	(c) Carpenters Mates.	(c) Bandmasters.
(d) Turret Captains.	(d) Water Tenders.	(d) Commissary Stewards.
(e) Quartermasters.		

II. PETTY OFFICERS, 1st CLASS

(1) Seaman Branch	(2) Artificer Branch	(3) Special Branch
(a) Masters at Arms.	(a) Boilermakers.	(a) Yeomen.
(b) Boatswains Mates.	(b) Machinist's Mates.	(b) 1st Musicians.
(c) Gunners Mates.	(c) Coppersmiths.	(c) Commissary Stewards.
(d) Turret Captains.	(d) Shipfitters.	(d) Ship's Cooks.
(e) Quartermasters.	(e) Electricians.	(e) Bakers.
	(f) Blacksmiths.	
	(g) Plumber and Fitters.	
	(h) Sailmakers.	
	(i) Carpenter's Mates.	
	(j) Water Tenders.	
	(k) Painters.	

III. PETTY OFFICERS, 2d CLASS

(1) Seaman Branch	(2) Artificer Branch	(3) Special Branch
(a) Masters at Arms.	(a) Machinist's Mates.	(a) Yeomen.
(b) Boatswains Mates.	(b) Electricians.	(b) Ships Cooks.
(c) Gunners Mates.	(c) Shipfitters.	
(d) Quartermasters.	(d) Oilers.	
	(e) Printers.	
	(f) Painters.	

IV. PETTY OFFICERS, 3d CLASS

(1) Seaman Branch	(2) Artificer Branch	(3) Special Branch
(a) Masters at Arms.	(a) Electricians.	(a) Hospital Apprentices.
(b) Coxswains.	(b) Carpenters.	
(c) Gunners Mates.	(c) Painters.	
(d) Quartermasters.		

All commissioned line officers with the exception of those promoted from the warrant officer class, together with all members of the Construction Corps, and certain members of the Marine, Pay, and Civil Engineering Corps, are graduates of the Naval Academy.

Congress has provided that each of its members, including both Senators and Congressmen, together with the President, shall appoint candidates to the Naval Academy at Annapolis, Maryland. These candidates are, by this provision of law, drawn from all classes of the people and from every state in the Union, and, provided they successfully pass a thorough and rigid physical and the prescribed mental examinations, enter into a four years course of study and training as midshipmen. At the end of this academic course they are commissioned either as ensigns in the line of the navy, assistant naval constructors, assistant paymasters, second lieutenants in the Marine Corps, or assistant civil engineers (Act of July 9, 1913).

AN ACT Providing for an increase in the number of midshipmen at the United States Naval Academy after June thirtieth, nineteen hundred and thirteen.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That after June thirtieth, nineteen hundred and thirteen, and until June thirtieth, nineteen hundred and nineteen, there shall be allowed at the Naval Academy two midshipmen for each Senator, Representative, and Delegate in Congress, one for Porto Rico, two for the District of Columbia, and ten appointed each

year at large: *Provided*, That midshipmen on graduation shall be commissioned ensigns in the Navy, or may be assigned by the Secretary of the Navy to fill vacancies in the lowest commissioned grades of the Marine Corps or Staff Corps of the Navy.

Approved, July 9, 1913.

The curriculum at the Naval Academy is comprehensive and thorough, both in its theoretical and practical studies, and is far too detailed to be made a part of this article. It is essentially military in all its attributes and includes the all important training in self-confidence and the leadership and handling of men.

> The answer lies in an unconscious influence of military education and training, one of the essential elements of which is the development of self-confidence. The man who may be called upon to lead a "forlorn hope" should approach his task with a strong belief in his ability to carry it through successfully. The intangible something very properly ingrained at the Naval Academy which makes a man jump unhesitatingly to attempt the apparently impossible when ordered to do so, is what I refer to.—RADFORD.[2]

Neither the theoretical nor the practical training ends with the completion of the four-year academic course. The navy is awake to the necessity and the strong desirability of postgraduate work for both officers and men, and to this end details special classes in civil, electrical and mechanical engineering, in naval construction, ordnance, chemical and metallurgical work, radio-telegraphy, and the arts of war. Civilians appointed to the Pay and Medical Corps are similarly trained by postgraduate work to fit them for the multitudinous duties of their positions.

ASSIGNMENTS

Line officers are, in accordance with their rank, experience and adaptability, assigned to the command of fleets, divisions, ships, navy yards, and stations, have charge of the machinery division of the manufacturing department in navy yards, perform ordnance, engineering and navigational duty ashore and afloat, serve in administrative capacities in the department and bureaus, act as attaches abroad, as instructors at the Naval Academy, the War College and training stations, and as inspectors and supervisors at private manufacturing plants.

[2] "Organization," by Naval Constructor G. S. Radford, U. S. N. PROCEEDINGS Whole No. 148, Vol. 39, No. 4, December, 1913; page 1683.

The commissioned officers of the staff corps, with the exception of the naval constructors and the present senior grades in the Marine Corps, have in the past been appointed and commissioned directly from civil life, their academic and collegiate training having been obtained in various private institutions prior to their affiliation with the navy. Their military-naval training has as a rule been acquired through experience and postgraduate work after their entrance into the naval service.

Staff officers, in accordance with their rank, experience and adaptability, are assigned to the various duties specifically allotted their particular corps. It should be noted that military seniority holds in these corps even as in the line, and further that line and staff are interlocked by seniority and precedence, dependent in part upon the date of entry into the service and date of commission in any particular grade or corresponding rank.

Officers belonging to the Construction Corps are, in accordance with their rank, experience and ability, assigned to duty in the Bureau of Construction and Repair in administrative capacities, have charge of the hull division of the manufacturing department in navy yards, may act as aids to commandants, perform construction and repair work ashore and afloat, act as special representatives abroad, and as superintending constructors at private manufacturing plants.

Members of the Pay Corps are similarly assigned to duty in the Bureau of Supplies and Accounts and are in charge of the general storekeeping, pay and accounting departments in navy yards and naval stations, and in similar capacities on board ships.

Members of the Civil Engineering Corps are assigned to duty in the Bureau of Yards and Docks and are in charge of the public works department in navy yards and stations, and act as inspectors and supervisors when public works are accomplished under contract.

The duties performed by members of the Marine, Medical and Chaplains Corps are so distantly related to the industrial part of the navy as to require no detailed mention in this instance. Each corps has its allotted duty to perform, its several units acting in harmony with the requirements of the major military organization, of which they are a part.

SHORE STATIONS

Under the broad title of shore stations are included all land establishments belonging to the Navy Department. This term is comprehensive of naval stations, navy yards, naval reservations, training stations, prison and detention stations, the Naval Proving Ground, Torpedo Station, magazines, Clothing Factory, Medical Laboratory, Naval Observatory, hospitals, Gun Factory and fueling stations.

Of these, the Material Division is primarily concerned, from an industrial standpoint with:

(a) Navy yards and Naval Stations.
(b) The Gun and Torpedo Factory.
(c) The Proving Grounds and magazines.
(d) Fueling stations (coal, oil and water storage).
(e) Clothing factory.
(f) Reservations (coal and oil).

ORGANIZATION AND GENERAL ADMINISTRATION OF SHORE STATIONS

The present system of organization and administration of our naval shore stations has been in part the result of long evolution. Changes have been slow, and rarely of radical growth; much of the good of past years has been retained, the constant effort having been to remove only the dross. Unfortunately, there have been periods when the main idea has been subordinated to political gain and greed; periods of stagnation and of wasted effort through needless duplication and decentralization. Local and sectional clamor have too frequently drowned the voice of national good. Appropriation and provision have too often been dependent upon the reprehensible "quid pro quo." It is perhaps Utopian to expect abnegation in our body politic, but year by year the division of spoils becomes more orderly.

It is not surprising, knowing the American temperament, that there should appear now and then a sporadic outbreak of criticism against the existing order of things. Such a condition is more than American, it is broadly human. The very absence of criticism, the quiescent contentment, are the antithesis of progress and efficiency. In all walks of life, we invaribly encounter some feeling of unrest; a desire for change, a striving for uplift, advancement and improvement. Unfortunately, the reformer is

the more frequently inclined to destroy the existing order of things, hoping in a visionary way to build palaces upon the ruins of hovels. Let us not forget that the old order, the existing order, changeth slowly.

The art of administration is as old as the human race. Even the leading wolf of a pack is an administrator. Organization is older than history, for the earliest documents, such as the code of Hammurabi, show the evidences of many generations of systematized social life. The real pioneers are the unknown promoters of the stone age, and the system-makers of the bronze age. Long ago almost every conceivable experiment in organization was first made. The records of history tell us of large units and small ones, of great and slight differentiation of functions, of extreme divisions and extreme concentration of authority, of mild and severe sanctions, of appeal to system and appeal to passion, of trust in numbers and trust in leadership. Of the vast variety of units of organization through which human intelligence has worked, and through which human purposes have beeen achieved, or thwarted, the greater part has passed away; and the names of them, even, have been forgotten.

In politics, the evolution has passed through the horde, the patriarchal family, the clan, and the classical city state. Nations have tried despotisms, oligarchies and theocracies, absolute and constitutional monarchies, and republics. In military matters the phalanx gave way to the legion and cohort, and these in turn to the division, brigade, battalion, regiment and company. Throughout history, the survival of the fittest, as between nations, has been fought out, in part, on the basis of the ability to use organized and cooperative methods of action. What a wealth of experience has been gained—and lost! How many times, in the long journey of history, have underlying administrative principles been, with enthusiasm, discovered, and rediscovered.

In this dilemma we may turn to the history of political and military institutions and find ample materials for the study of administration. The lines of activity have swept together millions of people into single organizations, and have made the leaders the cynosures of innumerable eyes.—PROFESSOR EDW. D. JONES.

One further quotation, even at the risk of redundancy, is considered worthy of our attention, and I quote in this instance from the report of a Congressional Committee that had as its chairman the present Secretary of Labor.

Any radical change in factory management should be gradual evolution out of that which has preceded. The present systems, or lack of systems, with their good and bad points, are themselves the result of long evolution. No drastic or radical change in them should be suddenly or even quickly imposed by fiat from above. Men have become accustomed alike to the good and the bad that are in the systems under which they work. They know and approve the good; they know how to combat the evil.

They are naturally and properly suspicious that motives purely selfish may be behind the sudden change. Confidence is a plant of slow growth.

The military man is essentially a leader, exercising his leadership when "responsibilities are terrifying and the greatest resource of soul is required to make decisions." He is a student of men in every sense of their being, a leader stimulated by the highest ideals, attaining to greatness and success through the men he leads, satisfied only when he knows his work has been well done, asking no greater reward than the gratitude of his fellowmen.

It is through this evolution and upon these beliefs that we have builded our present system—they may be accepted as the genesis of its being.

THE COMMANDANT

The supreme authority and command at a navy yard or other shore station is, under the direction of the Secretary of the Navy, vested in a naval officer of the line, known as the commandant, and as such exercising control over every department in the yard, and requiring a faithful and efficient performance of duty from all officers and employees under him.

The duties of the commandant are both military and industrial and in their exercise, from an industrial viewpoint, he is responsible for the preservation of all buildings and the stores contained therein, for all vessels out of commission, for the judicious application of labor, for the proper expenditure of funds and material, for the accomplishment of duly authorized work, and for the successful administration of the details of his office.

The details of general administration and organization of navy yards are in many respects similar to those existing in a number of our most successful private establishments, and it is the avowed intent of the Navy Regulations to create and maintain, in so far as may be practicable, relations between the commandant and the department and bureaus, similar to those existing between the commanding officer of a ship in commission and the department and bureaus.

REASONS FOR THE EXISTENCE OF NAVY YARDS

It is necessary that we once more focus the spotlight upon the fact that navy yards and shore stations exist for the fleet. Too much emphasis cannot be attached to this declaration and we

may, with no fear of contradiction, brand as fallacious the specious reasoning that contends for the reversal of this condition.

Rare, indeed, are the conditions that warrant the creation of needless naval work for the mere sake of retaining employees—rarer still the conditions that would warrant the creation of an exclusive and specialized naval industrial corps, be it military, semi-military, or wholly civil, holding life tenure of office, and charged only with the management of industries that may vanish overnight.

Wise, indeed, was the committee that reported to the Congress that no drastic or radical change should be imposed by fiat from above; let us not forget that men are naturally and properly suspicious that motives purely selfish may be behind these demands for change.

Should the day ever come when our navy yards and shore stations are exploited either for labor, or the organized management of labor, we will unwittingly, in response to these short-sighted and selfish demands, have written upon the beacons and buoys marking the channel approach to such yards those fatalistic words seen by Dante over the gates of hell; and the ships that enter therein shall not again come forth with the "fighting edge."

The fact is clearly recognized that a uniform labor roll is concomitant with economy, efficiency and the contentment of the personnel; and to attain this end every legitimate effort is made to avoid extreme fluctuations. The ships of the navy have been assigned to definite home yards; their regular docking and overhaul is accomplished in accordance with a carefully prepared schedule; little indeed has been left to chance or hazard, and yet in spite of our best efforts the very nature of the service performed makes increases and discharges an inevitable attribute that must be expected and accepted. Emergency work is subject to no preconceived schedule.

SUBDIVISION OF GENERAL ORGANIZATION

The activities and functions at a navy yard are grouped in accordance with the general organization, in the following departments:

(a) Manufacturing Department. { (1) Machinery Division. (2) Hull Division.

(b) Public Work Department.

(c) Inspection Department.
(d) General Storekeeper's Department.
(e) Pay Department.
(f) Accounting Department.
(g) Medical Department.

The manufacturing department, as will be seen from the above, is divided in accordance with the best recognized civil practice into two separate divisions, known, respectively, as the machinery and hull divisions.

The commandant, in his dual capacity of military and industrial senior, is the general manager of the manufacturing department—the department to which are assigned the shops, manufacturing and repair facilities of the yard.

It is this dual capacity, that, perhaps, puzzles the outside observer. It is upon this one point, the salient as it were, that the present opposition to the existing system of management is directing its heaviest gun-fire.

Let us examine frankly into the governing conditions, let us array the pros and cons. Things that are, exist only through some definite reason, and continue only so long as the support of exterior circumstances is accorded them.

There can be no denial of the military purpose of the navy, individually or in the aggregate; its auxiliary vessels, its gun-boats, destroyers, submarines, cruisers, and dreadnoughts have but one purpose, and attain to the maximum exercise of that purpose in the act of war!—a purely military function.

The purpose of the commissioned and enlisted personnel borne on the navy roster is to officer and man auxiliaries, gun-boats, destroyers, submarines, cruisers, and dreadnoughts, not for peaceful and prosperous voyages, but for war!—and in the strictest military way to employ every offensive and defensive feature built into these several classes of vessels in the attainment of victory, or, if perchance defeat, then the defeat of destruction.

Drills, exercises, evolutions, target practices, war-games, repairs and overhaul have but one avowed and recognized purpose: the training and preparation for war.

Secretary after Secretary, Congress after Congress, have by declaration, provision, and law indicated that the navy yards exist for the fleet. Does it not follow, then, that if the fleet exists either for the prevention of war, or its successful consummation

after national interests have justified its declaration, that the navy yards exist, even as does the fleet, for war?

If the purpose of the one be military, then by parity of reasoning, such must be the purpose of the other.

Navy yards are not eleemosynary institutions wherein men may attain to life-long sinecures. They are the military-industrial stations wherein vessels belonging to the military branch of the government may be constructed, repaired and fitted out for the performance of their military purposes. If this be not so, then what other reasons justify their existence?

Vessels of all classes can be built in private yards cheaper, perhaps, in most instances than the same work could be done at a government plant, but the fact remains that no private plant is prepared to receive, dock and overhaul a division of five dreadnoughts, to the exclusion of its commercial work. No private corporation is capable of carrying, constantly ready for issue, the material, stores, and munitions required by the division, the groups, and the auxiliaries based upon each of our first-class navy yards. No firm is willing to subordinate its daily routine, its schedules, and lay-out of work, upon the receipt of telegraphic orders to rush this or that group of vessels to completion.

Navy yards and all that they contain are but one link in the chain of readiness, or near-readiness, that permeates the entire navy. Truly has it been said that war is an affair of movement, of activity, of decision, based essentially upon preparation and readiness.

Unfortunately, the American people are not a maritime race, else it would be easier to bring home the force of this argument. We may, however, find an illuminating example in the industrial organization of our railroads. Engines, cars and equipment are purchased in the open market, subject to specification and inspection, but what road throughout the length and breadth of the land is dependent upon outside plants for the repair, overhaul and upkeep of its road-bed or equipment? The repair stations, roundhouses and division shops are to our railroads what navy yards are to our ships.

We do not for a second question the propriety of a railroad managing its own shops. Why then should we have the temerity to question naval management of things essentially naval?

By what tokens are the activities of a sea-going officer limited to navigation and gun-fighting? Let us not forget that the

modern battleship is practically self-sustaining, and that within her armored walls are contained engines, boilers and auxiliary machinery more powerful and complicated than we can find in any grouping on shore. Let us not overlook the fact that she is the home and the work shop, the school and the playground of perhaps a thousand human beings.

Sea-going means more than mere departure and arrival. Sea-knowledge does not stop with the study of the winds and the clouds. The game board with its little lead ships, presupposes that the man in the conning tower has officers and men under him capable of making the big ships and the the little ships go where he wills to take them.

To paraphrase an old story: "The trail over the hot sands may be long, the path to the mountain top may be rough and hazardous, but these are as nothing to the trackless trails of the sea. On land if anything happens—well, there you are; but at sea, should an accident occur, where are you?"

The uninitiated may ask what constitutes this ability to make the ships go to the place where the admiral would take them. Briefly, we may answer, the knowledge of navigation, tactics, electricity, steam engineering, mechanics, seamanship, and the leadership of men. It is the ability to pick the trail across the many waters, to avoid shoals and hazards, to keep the day's reckoning. It is the ability to hold position in formation night and day. It is the ability to produce and use both electricity and steam in the various mechanical appliances to be found on board a 30,000 ton battleship, or a 1,000 ton high-speed destroyer; to operate, maintain, and repair dynamos and generators; main engines, turbines, auxiliaries and boilers; to handle the ship in fair weather and in storm: to organize a crew, taken from the city and farm, into a happy, industrious, capable unit, to feed them, work them, drill them, educate them, yea, mother them, so that when the day comes you can fight them to the everlasting glory of the United States and of the flag under which they serve.

It is the ability, the genius, the mechanical and industrial skill to overcome great difficulties with the resources at hand. It will not suffice that we bring our fleet on the fighting line if it be in a crippled, exhausted and demoralized condition; better not to have cruised at all if such should be our state upon arrival within range of the enemy's guns.

All this and more is a part of the sea-going officer's knowledge and training.

The story of the battleship cruise around the world is a splendid record of the American naval officer's ability to operate and maintain the ships entrusted to his care. The history of the cruise of the Russian fleet from Libau to Tsushima is well worth reading.

OFFICERS IN CHARGE OF YARD DEPARTMENTS AND DIVISIONS, AND THEIR DUTIES AS SUCH

Agreeable to the idea of responsibility and authority vested in the commandant as the senior military and industrial officer attached to the yard or shore station, the system provides that there shall be an officer in direct charge of each department or division of the yard organization.

These departmental divisional heads are officers of the line or staff corps of the navy; that is to say, the head of the machinery division of the manufacturing department is a line officer; the head of the hull division of the same department is a member of the Construction Corps; the head of the inspection department may be detailed either from the line or staff. At the head of the other departments are officers of the Civil Engineer, Pay and Medical corps.

The officers in charge of the several departments and divisions herein enumerated are the agents of the commandant in carrying out the work of the Navy Department and its bureaus.

Whenever any item of work is authorized to be performed at a navy yard it devolves upon the commandant to direct its performance either by the machinery or hull divisions, or by the public works department, according to the nature of the shops and resources which may be required for its accomplishment; and when so assigned the work is done under the supervision and control of the head of the division or department concerned. Coupled with this supervision and control is responsibility for the manner and cost of performance.

DETAILS OF MANAGEMENT OF THE INDUSTRIAL ORGANIZATION OF NAVY YARDS

The system now in operation in the industrial organization of navy yards is a modification and adaptation of the essential fea-

tures existing in several prominent shipyards; in part, it is a modification of the so-called Vicker's system with central-office analysis of work so far as the major steps are concerned, and the preparation therein of essential preliminary papers. Its purposes may be briefly stated as follows:

(a) To secure easiest practicable beginning of work.

(b) To prevent an undesirable accumulation of material in shops.

(c) To properly follow up work.

(d) To secure best machine-tool results and fix standards.

The last purpose has through misunderstanding been made the subject of controversy, and in certain instances has been viewed with grave fears and apprehension by the employees. The cultivation of a feeling of mutual trust and dependence, the awakening of a spirit of loyalty, and experiences of actual operation, have to a great degree at last rendered this particular purpose acceptable to those now familiar with its object.

PLANS FOR FUTURE DEVELOPMENT AND EXPANSION

In the administration of naval affairs the past and the present must ever be regarded as preparatory periods for the future; a future that may be filled with the stupendous and exacting requirements of war. That we are not neglectful of these responsibilities is exemplified in part by the following extracts taken from recent reports made by the Board of Inspection for Shore Stations:

It is of paramount *military* importance to the efficiency of the fleet that, coincident with its extension, there should be a corresponding development of our leading navy yards and stations. Every additional battleship authorized by Congress entails a corresponding *military* responsibility or obligation to provide means for its efficient upkeep, as well as for its rapid and efficient repair. It is therefore imperative that the navy yards should be developed along every line which would fit them for more readily meeting the demands of the fleet.

Any delay in building up the navy yards or expectation of depending primarily upon private shipbuilding plants for meeting war demands of the fleet impairs naval efficiency and is a menace to our first line of national defence. The danger of such a policy may not be appreciated in time of peace, but there will come peril, if not national humiliation, if navy yard development is unduly restricted.

An extensive array of auxiliary vessels is the concomitant of an efficient fleet. Consistent with our increase in number of battleships and their

auxiliaries it is equally essential that there should be a parallel development of navy yard facilities.

The Secretary of the Navy in his annual report for the fiscal year 1912 devotes an equally strong paragraph to this same subject.

Future of Navy Yards.—It is essential to naval progress and efficiency that the development of the several navy yards should be concomitant with necessary augmentation of the fleet, and such efficiency can only be brought about through some central agency, which will carefully investigate the *military* usefulness of each yard, both in relation to its strategical, commercial, and manufacturing advantages, as well as in regard to its adaptability for contributing to the endurance and efficiency of the fleet.

The responsibilities of to-day are our inheritance from the past; they are our legacy to the future. Mindful of the unknown elements that the future may contain, we can but build in accordance with existing standards; we can but hope and strive to transmit to posterity, unimpaired, means and resources so essential to our national security.

SUMMARY

The experimental stage in the military-material-industrial organization of the navy may be considered as a thing of the past. The system now in active and successful operation is an accomplished and acknowledged fact. Its products are tangible and comparable. Fully able to meet the existing demands of the naval service, its facilities and resources are at the disposition of the other executive departments of the government.

Never, in the entire history of the navy, has its material, both ashore and afloat, been in better condition than it is to-day.

Within the confines of its organization the navy possesses every element essential to success; upon the continued and coordinated work of these elements rests the glory of future accomplishment.

Our naval strength and the measure of our greatness must ever depend in equal parts upon our material readiness and the prowess of our personnel.

DISCUSSION

The Military-Industrial Organization of the Navy

NAVAL CONSTRUCTOR G. S. RADFORD, U. S. Navy.—Having made a special study of the subject of organization, I found Lieutenant Commander Kearney's article very interesting. A careful reading of his paper indicates that he tends to rest his case on simple affirmations unsupported by reasoning and proof. Such declarations of opinion are of value, of course, as a "confession of faith" on the part of the writer; but are not very convincing when critically examined in the light of the facts. As he draws certain conclusions which seem to be unwarranted, I desire to invite attention to some of the more patent errors in his statements.

In view of Mr. Kearney's reference to "specious reasoning" quoted below, it may be well to note at this point that there is a well recognized art, known as argumentation, that endeavors to persuade and convince by an appeal to the intellect, using facts, logical reasoning, authoritative opinions, and similar means of proof. It is not mere contention. It does not rest its case on a simple affirmative statement. For example, Mr. Kearney states "Candidly, I must confess my inability to picture a semi-military corps," and apparently he desires the reader to conclude that because the author cannot understand it, it is an impossibility. When anyone makes a contentious and disputative statement, instead of using a reasoned argument, he places himself in the position of using the argument from authority, with himself as the authority. Now the difficulty with this type of argument is that its value depends on the reader's opinion of the authority used. Thus, when Mr. Kearney states in effect, that the "military-industrial organization" is "a coalescent union that defies separation"; also, "Inseparably associated with these military features—a tangible, integral and coherent part thereof—is the industrial organization," he places the reader in the position of having to choose between Mr. Kearney on the one hand, and Herbert Spencer and Admiral Mahan on the other. For the following quotations from Herbert Spencer and Admiral Mahan were published in a recent issue of the PROCEEDINGS, in connection with the question of whether there is a logical division between the navy's industrial work and its military work. Herbert Spencer stated "By the help of the defensive system the industrial system is enabled to carry on its functions without injury from foreign enemies; and by the help of the industrial system, which supplies it with food and materials, the defensive system is enabled to maintain this security." Similarly, Admiral Mahan states ". . . . naval administration is essentially civil in character, conditioned only by the fact that it subserves a military profession. In its methods it is strictly civil; it is military only in its end, which is to supply a military organization with the men and implements needed for operations of war"; also, "To make a

modern gun for a specific purpose involves ingenuity of conception, as well as delicate metallurgical and mechanical processes, conditioned by particular knowledge of ordnance questions; but there is nothing in this, from design to completion, that demands a military cast of mind, much less a military habit of life."

Mr. Kearney states that too much emphasis cannot be attached to the declaration "that navy yards and shore stations exist for the fleet," and he brands "as fallacious the specious reasoning that contends for the reversal of this condition." He states further, "if the purpose of the one be military, then by parity of reasoning, such must be the purpose of the other." Surely no one denies that navy yards and shore stations exist for the fleet. It is a self-evident fact. They exist for the fleet to such an extent that you must have them before you can have the fleet. The shipyards must be built before the ships can be constructed. It does not follow, however, that the shore stations are military because they exist for the fleet, nor does the fact that the purpose is military make the means military. For example, suppose that the navy should purchase oil lands, or coal mines, or even a flour-mill. Does the mere fact that they belong to the naval service make their operation military? The Naval Academy is a shore station, and surely it is a military station. Is the recently purchased dairy-farm therefore military? and does the milking of cows require military supervision?

As previously stated, simple affirmations are interesting as indicative of the writer's belief, but unless such statements are self-evident truths, it would seem that we might reasonably expect to find the writer furnishing some of the material for their disproof. Applying this test to the article under discussion, it is interesting to note that, while Mr. Kearney is careful to state in certain places, as noted above, his belief that the industrial and the military work of the navy are inseparable, statements made in other portions of his paper do not bear out his creed. In the third paragraph of his paper he divides the navy's labor between "a sea-keeping personnel of about 60,000 officers and men"; and "no less than 35,000 laborers and skilled artisans from practically every known trade and calling." Incidentally it may be noted that the "Official Register of the United States, 1913 Directory" gives the total of all civil employees of the entire Navy Department as approximately 26,200. But the point to which I wish to draw attention in this connection is covered by this question: Are those artisans and laborers military? For if they are not, then Mr. Kearney himself has made a separation of the industrial work of the navy from the military work. Again, in referring to the organization of the department, he states "material builds the ships, provides the stores and munitions, maintains repair yards, docks and fuel stations." Further on occurs this statement: "The duties performed by members of the Marine, Medical and Chaplains Corps are so distantly related to the industrial part of the navy as to require no detailed mention in this instance." Thus it appears that, although Mr. Kearney in one part of his paper does not believe that the military and the industrial work are separable, nevertheless he refers to the "industrial part" of the navy.

The relation of the industrial part of the naval service to the military branch is that existing between producer and consumer. The military branch calls on the industrial branch for certain war equipment. This equipment is produced by the industrial branch, and is turned over to, and operated by the military branch. A similar relation exists when the services of the industrial branch are requisitioned for repair work. But the fact that the industrial branch subserves the military branch hardly can be construed as converting industrial work into military work. I shall not take further space to discuss the question of the separation of the industrial work of the navy from the military work. The matter has been quite fully taken care of in other places, notably in the report of the personnel board of the Construction Corps, which I assume will be published in the near future. The board in question was at some pains to go into the question of organization very thoroughly, and to give its *reasons* in connection therewith.

Mr. Kearney says "that the value of an analogy is directly dependent upon the similarity of the subjects compared," but this does not deter him from stating further on that: "The repair stations, roundhouses and division shops are to our railroads what navy yards are to our ships." For the purposes of analogy this statement is true. He states further "We do not for a second question the propriety of a railroad managing its own shops." He might also have stated that no one for a second questions the propriety of the navy managing its own shops. But what he did not say, and this will complete the analogy, is that no railroad in the land would think of placing the production or repair of locomotives under its locomotive engineers or operating force. It is a well-known fact that the superintendents of motive power (*i. e.* the officials who manage the railroad shops) are specialized experts in this line of work which they make their life work.

Mr. Kearney continues by asking, "Why then should we have the temerity to question naval management of things essentially naval?" Are we not forced to draw a very unpleasant inference from this remark? If the industrial work of the navy is carried on by a semi-military industrial corps like the Construction Corps, is not the Construction Corps a part of the navy, and will not that work be managed by the navy? Or, is the only real navy the line? If that is what Mr. Kearney means when he calls his paper "The Military-Industrial Organization of the Navy," must we infer that there is also a military-medical organization of the navy, and that a naval hospital, which exists for the repair of the men of the navy, should be managed by a line officer?

It appears further that Mr. Kearney either purposely or unwittingly misses the real point in this question of the organization of the navy as regards the military and the industrial portions of its work. No one, so far as I am aware, expects the absolute separation of the one from the other. That would be just as absurd as endeavoring to separate the navy of the United States from the United States. The two parts of our work are mutually dependent, but of equal importance. We now come to the real question, which is: in dividing up the work of the navy is it better to have both the industrial and the military work performed by the same

personnel, or are the fields sufficiently broad to warrant having these widely different classes of work performed by different men. In explaining what constitutes the "ability to make the ships go to the place where the admiral would take them," Mr. Kearney answers, "the knowledge of navigation, tactics, electricity, steam engineering, mechanics, seamanship, and the leadership of men." We may add that when the ships have arrived at the place where the admiral takes them, a great deal more is necessary; namely, the knowledge of strategy, grand strategy, diplomacy, international law, history, political geography, foreign languages and customs, to say nothing of skill in the actual practice of the art of war. Now some of us hold this real professional work of the line officer in sufficient respect to believe that it is a "man's-size job" by itself. We fail to see the desirability of superimposing upon the line officer, the burden of perfecting himself in the work of the industrial expert; which involves, among other things, knowledge and skill in the practice of design, engineering materials, mechanical processes, shop and plant arrangement, output of machine-tools, methods of wage-payment and of handling labor, with the allied branches of production engineering. For these, and many other similar matters, are arising continually in the management of the manufacturing departments of navy yards, and in the general operation of our industrial work. Let me ask again: Should the military expert neglect the military work for a part of the time in order to give attention to the industrial side of our profession? Should the industrial expert neglect the industrial work for a part of the time in order to devote attention to the military work? Or should we distribute our work logically so that each man may have a progressive life-work along one main line within the limits of human capacity for successful performance, and thus avoid the distraction of being required to engage in various and widely different employments? The importance and the breadth of the fields involved, in both the military and the industrial work, would seem to be sufficiently great to warrant the development of real specialists and experts in each branch.

In concluding, let us look at this question from the standpoint of another analogy. Following Mr. Kearney's lead, we may say, of course, that an orchestra may not be compared directly with the navy of the United States; but the methods of handling the personnel may be compared; and if the positions in an orchestra were filled in the same manner that I assume Mr. Kearney would assign the personnel of the navy to duty, then the different instrument players would change instruments every three years, and, in addition, would alternate these three-year tours with assignments to duty as superintendents of instrument factories. I am quite prepared to believe that if an orchestra, run this way, had the same high-grade personnel as the navy, they would make music, but would it sound like a symphony orchestra? Of course this analogy is intended to be read pleasantly and without sarcasm or bitterness; nevertheless, I think we may seriously question whether, in our large and complicated organization, there are not some who would distribute the work among the personnel in almost as illogical a way. In the summary of his paper Mr. Kearney says "Within the confines of its organization the navy possesses every element essential to success;

. . . ." That is quite true. All that I am pleading for is a recognition of the thing that he seems to overlook, that in addition to possessing all of these elements we should *use* them so as to insure the most efficient results, not only by assigning the different branches of the work to those who are best able through experience and training to handle the respective branches, but also by permitting and encouraging the development of expert specialists.

ASSISTANT NAVAL CONSTRUCTOR C. A. HARRINGTON, U. S. Navy.—The article by Lieut. Commander Kearney is an excellent résumé of the present organization of the naval establishment for the performance of industrial work. As it consists in considerable measure of verbatim extracts from the Navy Regulations and Naval Instructions, discussion of the paper in its entirety involves in reality a discussion and criticism of navy regulations, which is unwarranted under the present circumstances. On this account and furthermore for the reason that the paper contains no striking message or arrives at no definite conclusions, except as hereinafter mentioned, discussion of the subject matter appears peculiarly difficult.

After careful study of Lieut. Commander Kearney's article, the writer inclines to the belief that it was prepared for the edification of the lay mind or more specifically speaking for those outside the service. It also seems that the article has been prepared as an initial argument against civilian management of navy yards, of which there seems at present to be a prospect, if credit may be placed in rumors and press reports now in circulation. Reason for the former belief is based upon the character of the subject matter, the repeated emphasis of the well known principles that (1) the navy is a military organization and (2) that "navy yards and shore stations exist for the fleet," with all of which naval officers are familiar and readily acquiesce. Reason for the second belief is based chiefly upon the statement in the author's summary or conclusion, to the effect that "within the confines of its organization the navy possesses every element essential to success."

Owing to the fact that the INSTITUTE PROCEEDINGS do not have a particularly large circulation among non-service readers, it does not appear likely that Lieut. Commander Kearney will be successful in bringing the department's organization before the general public or even before the country's men of industry. It is a pity and a positive money loss to the government that the *good* business methods of the Navy Department are so little appreciated by the business public. This lack of appreciation has been extensively investigated by the writer and is due almost exclusively to absolute ignorance on the part of the great business public, which is unable to differentiate between the good business methods of the Navy Department and the mediocre methods of the government in general. Occasionally, a firm complains, with justice perhaps in some specific instances, that it is not able to approach department representatives in a business-like manner or that too much "red tape" is involved, but in the vast majority of cases, the Navy Department is condemned because of unsatisfactory situations which developed in dealings with other branches of the Federal Government. Experience shows that it would be most

advantageous for the department to conduct an educational campaign among business men with the object of intimately acquainting them with the department's methods. If the personal experience of the writer serve as a criterion, the response would be gratifying. It is, however, difficult to see that much can be accomplished by a printed article in the INSTITUTE PROCEEDINGS, as it will be necessary for the department itself to enlighten the business world in a manner more or less similar to the present methods employed in advertising the service for recruiting purposes. A plan of action may easily be formulated. The result will be a better understanding and increased cooperation on the part of the business public, resulting in increased competition and consequent probability of lower prices for department supplies.

Under the subheading of "Subdivision of General Organization," the author appears to justify the present navy yard organization against the possibility of future civilian control. If this understanding be correct, a direct statement of such purpose accompanied by the overwhelming arguments that can be mustered against such a proposition as civilian management would in the opinion of the writer be more forcible than the actual method employed in the treatment of this phase of the subject matter. The author does a great service, however, in bringing to the attention of naval officers the possibility of civilian control of navy yards. Discussion of the present system of navy yard management is not intended by the writer, but rather instead to concur emphatically with the author that "within the confines of its organization the navy possesses every element essential to success." If there be any doubt on this score, an investigation of the managerial personnel of private American shipyards, (the nearest approach to navy yards considered industrially), should be sufficient for the doubter. Any claim that there are no civilians capable of managing a navy yard efficiently, even from a military viewpoint, would of course be absurd, but everyone knows that the talent required for such work is such as to merit a much larger salary than the government would care to pay; the converse would therefore naturally happen, namely that at the government's price mediocre ability only would be secured and the consequent results would be intolerable.

Under the subheading "Subdivision of General Organization," the author introduces the unfortunate analogy of the Navy Department and the railroads. After repeated insistence upon the feature of military control of navy yards why make comparisons with purely industrial concerns like the railroads? No one questions the propriety of a railroad to manage its own shops, but if the high administrative officials of any railroad placed engine drivers, brakemen, conductors and firemen in charge of its repair shops periodically, that railroad would in all probability be rebuked by the Interstate Commerce Commission. If it be desirable to compare the industrial organization of the navy with any other organization, it would be more logical to make comparison with a military organization such as our own army, where possible, or with the navy of some other country. A comparison of navy yards with the ordnance shops of the army such as at Watertown Arsenal is particularly recommended.

Whenever an opinion from outside source is introduced to strengthen one's argument, care should be taken that the authority so quoted be above criticism. In this connection, it is believed that the author does not improve his case in the remarks under "Organization and General Administration of shore stations" by introducing the extract from the report of the Congressional Committee which investigated the "Taylor and other systems of shop management." In view of the testimony given before this committee at its various hearings, there is just ground for the belief that its findings were partial to Labor. Aside from this feature, the opening sentence of the quotation referred to is sufficient to condemn the remaining parts of the extract. It is difficult to conceive how any *radical change* can be one of *gradual evolution.* (Italics are the writer's.) It seems therefore that the author is unfortunate in his selection of authorities.

In conclusion, the author should be commended for bringing before the readers of the INSTITUTE PROCEEDINGS, such a clear and succint description of the military-industrial activities of the navy. It is well to contemplate frequently on the great degree that military efficiency is due to the industrial efficiency of the navy. Honest difference of opinion may exist as to the intimacy of the union of military and industrial organization in the navy and, while it may be pointed out, notwithstanding the statement of Lieut. Commander Kearney to the contrary, that the present navy yard organization permits of a partial separation of the two forms of activities, it is more the desire of the writer to enforce upon all the absolute precept that industrial efficiency makes for military efficiency in the navy. Sacrifice of the former will inflict injury to the latter.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

TAMANEND *VS.* TECUMSEH

IDENTIFICATION OF THE FIGUREHEAD OF THE UNITED STATES SHIP OF THE LINE DELAWARE

(See frontispiece)

By COMMANDER CHARLES F. PRESTON, U. S. Navy

The figurehead of the *Delaware* is a part of the tradition of the United States Naval Academy. It is mounted on a stone pedestal facing Bancroft Hall.

To every graduate of the Academy, there is a certain amount of sentiment connected with this figurehead which represents an Indian chief known by the midshipmen as "Tecumseh," the god of "2.5" (the lowest satisfactory mark in any subject in the curriculum).

The object of this article is to clear up any doubts as to the identity of the Indian chief portrayed by the figurehead, and the letters which follow are copies of official documents and are therefore authentic.

UNITED STATES NAVAL ACADEMY,
ANNAPOLIS, MARYLAND,
DEPARTMENT OF ENGLISH,

February 17, 1914.

From: Committee on Memorials and Exhibits (Commander C. F. Preston, Senior Member)

To: The Superintendent, U. S. Naval Academy.

Subject: Facts concerning the figurehead of the United States Ship of the Line "DELAWARE."

1. At the suggestion of the Superintendent of the U. S. Naval Academy, we have obtained the authentic data regarding this interesting and historic relic from the Navy Department archives through the co-operation of Chief Constructor R. M. Watt, U. S. N., to whom thanks are extended.

2. Instead of writing a résumé of the facts established, we think it best to publish in the U. S. Naval Institute copies of authentic official letters which in themselves would be interesting to all graduates of the Naval Academy, besides giving a complete history of the figurehead of the U. S. Ship of the Line Delaware.

3. The letters are hereto attached.

4. If approved by you, the article will be published as outlined in paragraph 2 of this letter.

C. F. PRESTON.

154-14-1 Feb. 19, 1914.
Approved,
W. F. Fullam
Captain, U. S. Navy,
Superintendent

NAVY DEPARTMENT.

BUREAU OF CONSTRUCTION AND REPAIR,

Refer to No. 1687-A. 135. WASHINGTON, D. C. February 16, 1914.

From: Chief Constructor.

To: Commander Charles F. Preston, Naval Academy, Annapolis, Md.
Subject: Information with respect to the Indian Chief Tamanend.
Reference: Your letter of Jan. 20/14.
Enclosures: (A) Eight letters (copies) from Bureau's archives.
(B) Extract from Heckenwelder's account of the manners and customs of the Indian Nation.
(C) The papers which accompanied your letter.

1. I have had the official files of the Bureau of Construction and Repair carefully examined, and forward herewith the enclosures referred to above. This correspondence makes it clear and definite that at the suggestion of Senators Vandyke and Horsey and of Representatives Hall and McLane. the attempt was made to portray Tamanend, the distinguished Chief of the Delaware Indians, as the figurehead of the DELAWARE; that, further, the ship was launched on the 21st day of October, 1820. and not in 1817 as appears on the cut in the Army and Navy Register of October 4, 1913. and I think is repeated on the stone pedestal now in Annapolis.

WATT

NAVY DEPT.

SIR: May 17, 1820.

Under the resolution of Congress of the 3rd of March 1819 relative to the manner in which the vessels of the Navy of the United States shall be named. It has been determined that the states after which the Seventy Fours shall be named are to be ascertained by lot, under the direction of the Navy Commissioners.

Commissioners will accordingly proceed to ascertain the name to be given to the 74 now building at New York and notify the Commandant of that place of the same.

Respectfully
your most obedient servant
SMITH THOMPSON.

P. S.
Maine and Missouri are to be excluded from the list of states in determining name of ship now building at New York

To
John Rodgers
President Naval Board

NAVY COMMISSIONERS' OFFICE,
16th Oct. 1820.

SIR:

The Commissioners of the Navy have the honor to inform that having this day drawn for the ship of the line to be launched on the 21st instant at Norfolk, they drew the name of the State of DELAWARE.

I have the honor to be with great respect. Sir
Your most obedient servant,
JOHN RODGERS.

Hon.
Smith Thompson,
Secretary of the Navy.

NAVY COMMISSIONERS' OFFICE,
9th Dec. 1820.

SIR:

The Commissioners of the Navy have not yet decided upon the figure head of the ship of the line DELAWARE. They desire to adopt a head appropriate to her name and they request that you will favour them with your assistance on the occasion by naming an appropriate figure head. The ships head is adapted to the size of a full bust.

I have the honor to be &c.
JOHN RODGERS.

Hon.
Mr. Vandyke,
Senate.

WASHINGTON, Jany. 5, 1821.

SIR:

In compliance with the request of the Hon. Commissioners of the Navy communicated in your note of 9th Dec. last, relative to a figurehead for she ship of the line "The DELAWARE," we beg leave to direct their attention to "Tamanend," the most distinguished Chief of the Delaware Indians. The character of this celebrated personage is given in Heckeweldus account of certain indian nations, an extract of which is inclosed.

The name of "Tamanend" being thus connected with the early history of our country, his bust will in our opinion be an appropriate figurehead for the ship of the line "The DELAWARE." Should the Honorable Commissioners concur with us in opinion, we submit for their consideration the annexed outline, subject to any correction which their taste and judgment may suggest.

We have the honor to be
very respectfully
Your most obedient
Vs VANDYKE.
O. HORSEY.
WILLARD HALL.
L. MC.LANE.

Commodore
John Rodgers.

EXTRACT FROM HECKEWELDERS ACCOUNT OF THE HISTORY OF MANNERS AND CUSTOMS OF THE INDIAN NATION.

TAMANEND.

"The name of Tamanend is held in the highest veneration among the Indians. Of all the chiefs and great men which the Lenape nation ever had, he stands foremost on the list. But although many fabulous stories are circulated about him among the whites, but little of his real history is known. The misfortunes which have befallen some of the most beloved and esteemed personages among the Indians since the Europeans came among them, prevent the survivors from indulging in the pleasure of recalling to mind the memory of their virtues. No white man who regards their feelings will introduce such subjects in conversation with them.

All we know of Tamanend, therefore, is that he was an ancient Delaware chief who never had his equal. He was in the highest degree endowed with wisdom, virtue, prudence, charity, affability, meekness, hospitality, in short with every good and noble qualification that a human being may possess. He was supposed to have had an intercourse with the great and good spirit, for he was a stranger to everything that is bad.

When Col. George Morgan of Princeton, in New Jersey, was, about the year 1776, sent by Congress as an agent to the western Indians, the Delawares conferred on him the name of Tamanend in honor and remembrance of their ancient chief and as the greatest mark of respect which they could show to that gentleman, who they said had the same address, affability and meekness as their honoured chief, and therefore ought to be named after him.

The fame of this great man even extended among the whites, who fabricated numerous legends respecting him, which I never heard, however, from the mouth of an Indian, and therefore believe to be fabulous. In the revolutionary war his enthusiastic admirers dubbed him a Saint, and he was established under the name of St. Tammany the Patron Saint of America. His name was inserted in some calendars and his festival celebrated on the first day of May in every year."

PROPOSED FIGURE HEAD FOR THE SHIP OF THE LINE "THE DELAWARE."

Bust of Tamanend, the celebrated chief of the Delaware Indians.
Drapery—A Blanket with a Belt in which is a Tomahawk.
Over the left shoulder—A Quiver of Arrows.
One hand resting on a Bow & the other Hand holding the Calumet.

NAVY COMMISSIONERS' OFFFICE,
20th January, 1821.

SIR:

We wish to have the figure of the Indian Chief Tamanend for the figure-head of the DELAWARE. Will the cut water admit a full figure of appropriate length? If the cut water of the ship will admit such a figure we should desire the drapery to be a blanket with a belt and Tomahawk on it, on the left shoulder a quiver of arrows, one hand resting on a bow and the other holding the calumet. On the stern we wish the Coat of Arms of the State of Delaware, as described in Binn's sheet of the Declaration of Independence to be carved.

You will be pleased to inform us as early as may be in your power whether the proposed figurehead can be conveniently attached to the ship.

Respectfully,
JOHN RODGERS,
President.

Captain John Cassin,
Portsmouth,
Virginia.

NAVY YARD, GOSPORT,
5th February, 1821.

GENTLEMEN:

Enclosed you will receive the opinion of Mr. Grice, Naval Constructor, relative to the figurehead of the DELAWARE. I have the honor to be,

Very respectfully,
Your most obedient servant,
JOHN CASSIN.

The Honorable Commissioners
of the U. S. Navy,
Washington.

SIR: NAVY YARD, 5th February, 1821.

Your letter of the 30th January has been received. In answer to which I would observe that the statue of an Indian Chief nine feet in height can be placed on the Line of Battleship DELAWARE which would be an appropriate size for the Cut Water.

Respectfully,
Your obedient servant,
FRANCIS GRICE.

Commander John Cassin.

Approved John Cassin.

NAVY COMMISSIONERS' OFFICE,
13th Jan. 1821.

GENTLEMEN:

The Commissioners of the Navy have had the honor of receiving your communication of the 5th instant for which they tender you their thanks.

Possibly, gentlemen, you were not aware of the fact that we have already a ship of the line with an Indian Chief figure head. Such a figure was selected for the Ohio and is now on her. Will this circumstance constitute with you any objection to our adopting your suggestion as to the figurehead of the DELAWARE, if not we will, with pleasure, adopt it. If, however, you should, under these circumstances, suggest any other figurehead for the ship we shall be happy with your wishes on this occasion.

I have the honor to be, with great respect, &c.

JOHN RODGERS.

Honbls.
Mr. Vandyke, } of the Senate
Mr. Horsey, }
Mr. Hall, } of the House of Representatives from Delaware.
Mr. McLane, }

SIR:

WASHINGTON, Jany. 18, 1821.

I have made known to Mr. Horsey & Mr. Mc. Lane, the fact stated in your note of the 13th instant that the Ship of the Line "The Ohio" has an "Indian Chief Figure Head" and we concur in opinion that notwithstanding that circumstance the bust of Tamanend will be an appropriate figure head for the Ship of the Line "The DELAWARE." Mr. Hall is absent from the city.

Very respectfully,
Yo: Mo: Obt.
V. S. VAN DYKE.

The Hon:
John Rodgers.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

WHAT SHOULD BE THE RELATIONS BETWEEN THE BATTLE FLEET AND THE RESERVE FLEET

By CAPTAIN W. S. SIMS, U. S. Navy

NOTE.—The following lecture was written by Commander W. V. Pratt, U. S. Navy, while a member of the Naval War College staff and, beyond being somewhat modified to facilitate oral delivery, was not changed in any essential respect before being delivered before the officers of the reserve fleet, to whom, of course, the above explanation was made.—Wm. S. Sims.

The determination of the most effective method of employing reserve ships in time of war requires of course only that we correctly apply the principles of naval warfare to the existing conditions as regards our material and personnel, and this application will be attempted in this paper.

DEFINITION OF TERMS USED IN THE DISCUSSION

It may be well first to define certain terms used for convenience of explanation. These terms are: war battle fleet, war reserve fleet, peace active fleet, and peace reserve fleet.

The terms have no virtue in themselves. They are not standard, nor are they intended as such, but merely as conveyors of definite ideas.

By a war battle fleet is meant a fleet composed of all of the fighting units that can be assembled within the theater of operations and that are capable of taking part in battle or in any of the secondary operations in connection therewith or in preparation therefor. It is not composed of one type, but of all types that can be used with efficiency in coordinate action.

By a war reserve fleet is meant a fleet composed of fighting units of such relatively low power or speed that if acting as a component part of the war battle fleet, they would diminish the power of that

fleet; though if acting in conjunction with the war battle fleet they could probably assist it.

For example, the *Indiana* class in a squadron of dreadnoughts would necessitate a reduction in squadron speed of six knots and a reduction in range of about 3000 yards. Their presence would decrease the effectiveness of the dreadnoughts, whereas if employed with other similar vessels as a separate body for secondary operations they might be of great service.

A peace active fleet is such fleet as our policy and our probable enemies make necessary to keep in active service during peace time.

A peace reserve fleet is the fleet which policy and economy make necessary to keep in a state of potential power of active being. It is a fleet that keeps alive but reserves the use of its full powers.

THE CONSIDERATION OF THE SECOND LINE

Why should a reserve fleet exist? Does it exist because of the cost of maintaining all ships in active service? Does it exist to form a second line for the fleet? Does it exist to form a second line of defence for the coast?

If the war battle fleet is to be used as the first line of defence for the home coast, it follows that that line should be as strong as possible. No unit that can make it stronger should be neglected in its make-up. That fleet will be the strongest in its first line, which can use effectively the maximum number of its units there. If the war battle fleet is to be used for offensive purposes and away from its home coast, still that fleet is strongest in its first line which can use all of its available units in that line. If vessels that are capable of adding to the strength of a single body of ships be separated into two bodies and be met by an enemy equal in power concentrated in one body, the former may be beaten in detail. Such separation would be a violation of the basic principle of warfare.

Hence we may make this rule for the war battle fleet: "All fighting units that joined together in a fleet add to the efficiency of that fleet, should be with it when the action comes on. All effective units should be where they may strike together in order that the blow may have the force and resistance of numbers."

It therefore follows that only those ships should be in a war reserve fleet that are not powerful enough to add strength to the first line war battle fleet.

THE CAUSE AND USES OF A WAR RESERVE FLEET

Why then does a war reserve fleet exist?

It exists simply because deterioration due to time, and loss of relative power due to progress, have brought it into being. We have the vessels, but they are insufficient in power and speed to add strength to the first line of battle. But, though weak as compared to those of the first line, they are actually of considerable power and may be used in many ways greatly to assist in carrying out the objective of the campaign, provided of course their operations are coordinated with that of the main fleet; and to this end the war reserve fleet, as well as all other vessels engaged in the operations, must always be subordinate to the commanding officer of the war battle fleet.

What may be the uses of a war reserve fleet in connection with the war battle fleet? It has been stated that the units composing the war reserve fleet will be those units that are insufficient in power and speed to fight actually in and with the first line. Then the primary use of the war reserve fleet will be such aid as it can render outside of the first line—and its best aid will be battle aid. This battle aid will be best rendered if it strikes its blow as nearly as possible at the same time the war battle fleet strikes. If there be any units with the enemy similar in characteristics to those composing our own war reserve fleet, that blow will probably quickest and hardest reach them. If there be no such enemy units, the objective of the war reserve fleet will probably be those crippled units of the enemy war battle fleet that have in the action dropped out of the first fighting line. But in order that the war reserve fleet may pass over the enemy water, its own battle fleet, or first line, must be powerful enough to force the issue and not give ground. Hence no unit may be left out of the first fighting line that can be employed efficiently therein. Moreover power to advance, more than speed in advancing, plays a controlling part, but this power to advance is always dependent upon the law of opposing greater force at the given point at issue than the enemy can oppose. This depends somewhat on speed. It then follows that the fleet having to fight on the defensive for want of enough powerful fast units to put in its first line will ultimately fight on a line where both its war battle fleet and war reserve fleet are merged into a single line, whereas a fleet, having the power to fight on the offensive, will fight on two lines. It therefore follows that

a country on the defensive (and we are practically on the defensive against, for example, such a country as Germany) must plan to fight where our war reserve fleet may come into the action, coordinated as regards speed and power with our war battle fleet. This problem then becomes one of tactical maneuver rather than tactical organization after the composition of the war reserve fleet is settled.

A PRACTICAL CONSIDERATION OF TWO WAR FLEETS

Dropping for a moment the theoretical aspect of this question of the relations existing between battle and reserve fleets in war, let us consider the possible case of Germany as being at present nearest to us in point of numbers. In 1915 Germany can have in the water about 17 ships of the dreadnought type and about six ships of the dreadnought cruiser type. Their speeds range from 20 knots to 27 knots. She can also employ about 22 older type battleships, pre-dreadnoughts, of a speed of about 17 knots. Neglecting the older ships, Germany will have a total of 23 fast and powerful ships. In 1915 we will have about 12 of the dreadnought class, speed about 20 knots. Ship for ship our types are somewhat stronger and better, I believe, but in preponderance of numbers she will have 11 or 12 in excess. In addition to our dreadnoughts, there will be about 25 of the older battleships, including the *Indiana* class. The speeds of these range from 18 to possibly 13.5 knots. Neglecting the intermediate calibers and considering only the heavy big guns, each of these 11 or 12 extra dreadnoughts of Germany will have at least double the big gun fire of any of our older battleship types. They also have the speed to choose that range which will make their fire the most effective. Those 11 or 12 extra ships will then have the value of 22 or 24 of the older battleships. They also have the decided advantage of concentration of force in a short battle line, and the advantages that speed gives in maneuvering ability. Owing to the combination of the tactical qualities of speed and power, they can possibly force the direction of the battle. Can there be any question at all of the practical disposition of our battleships in a war battle or war reserve fleet? None at all, so it would seem. From a consideration of numbers alone, we are forced to attempt to meet the first line of Germany with an equal force. From her ability to force the issue, we are on the defensive from the start, and the first line,

or war battle fleet, may be forced back on the war reserve, so that the latter will of necessity enter into some stage of the action. That being the case, the sooner it does so the better. Hence the vital questions with us are, first, not shall we put our old battleships into the war battle fleet, but how shall we get them in, paying due consideration to the tactical factors of speed and power; and, second how shall the war reserve fleet get in its blow quickest and hardest. The navy will not long exist as a fighting force if it attempts battle piecemeal. This is merely one of the problems referred to as being the province of the war battle fleet to solve during the war period, or mobilization period, of the year.

AUXILIARY USES OF A WAR RESERVE FLEET

Other uses of the war reserve fleet is employment in defence of an attacked advance base, or its use locally at some attacked point, on the home coast, but never to be far away from the battle fleet when the threat of battle against the main enemy battle fleet is imminent.

It would then appear that a war reserve fleet, in so far as its major units are concerned, exists only because it cannot get into the battle first line; that its primary duty is to aid the battle first line to the fullest extent during the battle; that its secondary duties are to render auxiliary services to that war battle fleet. Such being the character of its duties, its organization, administration and life are not apart from the war battle fleet, but are a part of it, and its leader must be recognized as a factor intimately related to but under the commander of the war battle fleet.

The types that may be used efficiently in the war reserve fleet are the older vessels that cannot be employed in the first line battle fleet, including monitors, old torpedo-boats, old destroyers, harbor defence submarines, peace gunboats, and old cruisers that are too slow and old to take any part in active scouting duties.

All auxiliary duties, such as the defence of a base, the task of leading and conducting the train blockade, coast defence, patrol when possible, are the duties of the war reserve fleet, but even these duties are subordinate to such aid as it may render the first line fleet on the day of battle, and its place is as near as possible to that line with all the force that can be usefully employed. The details of such work rest with the leader of the war reserve fleet, subject to the general instructions of the commander of the war battle fleet.

GENERAL ORGANIZATION AND ADMINISTRATION OF WAR RESERVE FLEET

The character of the organization and administration of the war reserve fleet should be similar to that of the war battle fleet, as far as may be possible, in order that there may be no unfamiliarity with the principles of the structure, and the least loss in coordinated effort.

The main lines of the organization should be decided upon in time of peace. The decision in this matter necessarily lies with the Navy Department and the commander-in-chief, that is, with those who will be responsible for the successful employment of our entire naval force.

The ships of the peace reserve fleet that the commander-in-chief believes can successfully fight in the first line, with the tactics he intends to employ, should be designated and assigned their places. They are really a part of the battle fleet held in reserve because of lack of funds or of personnel.

The remaining vessels will constitute the war reserve fleet, and, manifestly, the organization of this group of vessels in time of peace should be the organization that would render it most useful in time of war. In other words our organizations and the training of the personnel should be carried out now, and not after war breaks out—and this organization should extend not only to the vessels now in reserve, but to all vessels that will be used in war; that is, every serviceable vessel should now be assigned her place in the various organizations.

MOBILIZATION OF THE WAR RESERVE FLEET

The mobilization of this fleet should take place at one well chosen, rather central point. Its efforts should not be scattered. The question of local defence should not be met by a detachment of units from the war reserve fleet, but rather by united effort and preponderance of numbers. The virtue in potential power of a mobilized fleet, when every unit is shoulder to shoulder with every other unit, is great and reaches its maximum when so used. To this end there should not be two war reserve fleets, one on this coast and one on the Pacific, but only one, and upon a threat of war this combined fleet should be mobilized somewhere near the center of the area of operations.

This should be the aim and object, even if at times somewhat impracticable. The same rules for concentration of effort that apply to the war battle fleet, apply equally to the war reserve fleet.

THE PEACE RESERVE FLEET

A reserve fleet does exist at the present time, but it is a peace time reserve fleet, not a war reserve fleet. The guiding principles of the necessity that prompts the establishment of a peace reserve fleet is economy. Such a principle is absolutely sound so long as the ways and means for the transition from a peace to a war footing are also sound. The danger lies in not providing ways and means, in lack of consideration of guiding principles, in not realizing the critical moment for the transition to take place, and in not being prompt enough in action. A danger lies also in unfamiliarity with the ways and means provided. With sound organization, sound training, sound administration, and sound methods of mobilization, a peace reserve fleet is not only economical but an efficient way to secure greater numbers of ships, because what is thus saved in peace maintenance may be spent in increase of the navy. All the basic principles of scientific management point to the soundness of a peace reserve fleet. But the cogs that intervene in the transition from peace to war must be kept oiled and in condition, the human element as well as the material, in order that the transition may be on sound lines, efficient and prompt. Such a task I do not believe to be an impossibility, but it must be based upon comprehensive and thorough study. It is not correct to form a reserve fleet which is a compromise between a peace reserve fleet and the war reserve fleet which necessity will impose upon us.

A CONSIDERATION OF SOME OF THE RELATIONS EXISTING BETWEEN A PEACE RESERVE AND A PEACE ACTIVE FLEET

We have now arrived at a point where a consideration of some of the relations that might exist between the peace active fleet and the peace reserve fleet are in order. I think it safe to say that a country which is rich enough should first be governed by external influences in determining the quantity of its peace active fleet. By external influences I mean its relations to foreign countries. The

question of the most probable antagonists must always be the governing factor in determining actual numbers and disposition of the peace active fleet. The question of time available in which to transfer from reserve to active fleet must also play its influencing part. These being settled, there is no reason why any ship, new or old, may not find its proper place in either the peace active fleet or the peace reserve fleet, provided always the factors, efficiency and economy, are properly coordinated.

The one vital thing to bear in mind is the question of arrested efficiency and retarded development in those units that are in the peace reserve fleet; and incidentally the unavoidable result of arrested efficiency will show itself more quickly in the personnel element than in the material. The mobilization period of each year is the "war time" period of that year, the rest being peace time. During this period all the units should take their places in the war battle fleet or the war reserve fleet. There will then exist no peace reserve fleet as such, and the active fleet will have passed to a war footing.

The great difficulty to be overcome in this transition is not a material one, it is a question of men and officers. Without going into the solution of this, which is a detailed problem in itself that has been treated elsewhere, the line of action should be in the direction of a well established naval reserve.

This establishment must be worked out not on independent lines, but with due consideration of the naval establishment as it exists, and as it may exist both in classes of naval ships proper and auxiliaries that may be bought.

Again, no naval reserve establishment, whatever be its character, can be said to be organized to full working capacity unless it provides for a complete and rapid manning of both the war battle fleet and the war reserve fleet and all necessary shore stations and fleet auxiliaries.

This question of a naval reserve is involved in the general subject of mobilization which is now engaging the attention of the department. An attempted analysis of its main lines is contained in a paper which I submitted to the Naval War College in September 1912.

TWO PERIODS IN EACH YEAR

A CONSIDERATION OF THE PEACE PERIOD (TRAINING)

I divide the two periods in each year as follows: The peace period (training) and war (mobilization). During the peace period, the peace active fleet will hold its gun drills, its target practices, its efficiency drills, its maneuvers for precision, and all that tends to bring up to the highest pitch both the material and personnel. As far as possible the peace active fleet should not include in its organization any units undergoing extensive repairs. These units should be assigned to the peace reserve fleet. But units in the peace reserve fleet, even while there, should always hold their proper numbers in the squadrons and divisions of the war battle fleet to which they belong, so that during the mobilization period of the year they may immediately resume their proper positions in that fleet.

During the peace time or training period of the year, the peace reserve fleet will be occupied in repair work, maneuvers and gun drills and steaming tests as far as practicable should be held. The nucleus crew from one-third to one-half complement, should be composed of picked men. The new recruit, when he leaves the training station has no place in any reserve fleet, his best breaking-in place is in the peace active fleet. Somebody must make a man-of-war's man of him, and this can be best and most quickly done in the more active of duties of the active fleet.

A CONSIDERATION OF THE HUMAN ELEMENT

One more factor deserving attention is the human element. Unless all parts composing this element work in harmony, there can be no coordinated effort. Not only must these parts work in harmony with each other, but they must harmonize with the material things they control. The work to be done, and fitness to do this work, are necessarily dependent upon the human element, and unless this element is employed to the best advantage, the result cannot be satisfactory. It is recognized that those ships of the peace active fleet having fewest changes in officers and men during a commission stand the best chance of being efficient, and it should be equally well recognized that a peace reserve fleet is subject to precisely the same influences. Hence to shift crews repeatedly, to shift officers, especially the controlling, the com-

manding officer, when a ship passes from the active to peace reserve fleet, is fundamentally wrong. Such changes should be as slight as it is possible to make them, and not as sweeping as they can be made. But it always will be a sweeping change so long as the question of rank and seniority and not the work to be accomplished is made the pivot. Instead of detaching the captain, senior officers and leading men, they, of all others, are the ones that should stay by the ship whether she be in active or reserve service. It is their influence that makes and dominates the ship. The question of whether it is a junior or a senior who goes out into the active fleet plays but a minor part in the efficiency of the whole, compared to the vital one of continuity of effort. All work should be along the line of training for efficiency.

THE TWO FLEETS, BATTLE AND RESERVE, IN THE MOBILIZATION PERIOD OF THE YEAR

Having considered the question of the peace active fleet and the peace reserve fleet during the training period, which is of course the greater part of the year, we may now consider the war battle fleet and the war reserve fleet during the mobilization period. Everything should be mobilized that can be used, even the gunboats, or special service ships. First in importance is the full war battle fleet; second, the war reserve fleet. This is now not the repair and training period; it is the fighting period, the period for maneuvers in strategy and tactics, the period for battle target practices, when the attention of all should be turned from the ship ahead in our own fleet to the ship opposite in the enemy's fleet. That is a vital difference between training maneuvers and war maneuvers.

This mobilization or war period is the time of all others when the commander-in-chief should have under him all the different units that he would have in a war. The time taken to mobilize the two fleets will depend upon the preparations already made by the yards, the department and shore forces generally. The efficient use of the mobilized fleets will depend upon the preparations previously made by the commander-in-chief and by his assistants. The larger problems of strategy, tactics, gun fire, torpedo practice, day and night battle, always simulated against an enemy, are the ones to be worked out. If a fleet battle practice be held there should be no special allowed time for training it—that comes in

the peace period. As the units enter the mobilization period so should they stand. If this principle of continuous readiness for war is not observed, we can never solve the problem of rapid transition from peace to war conditions. It must be the period of rapid action, passing from one problem to another without special training during the period. The analysis, the summing up of errors, will come later during the succeeding peace period. Now is the time to do, and to collect data only.

Without going into details, this means work on these problems during the training periods; not solutions made at a War College alone, but problems solved in the fleet itself in the manner they are solved at the college, and then tried out practically.

The mobilization is, above all, the time when the efforts of the naval reserve should be coordinated with the efforts of the active naval service. Their afloat periods might coincide with this period.

SOME QUESTIONS THAT HAVE ARISEN CONCERNING THE RELATIONS BETWEEN ACTIVE AND RESERVE FLEETS

The following are some of the questions in connection with a reserve fleet that have come up for solution.

(1) In time of war should the reserve ships be added to the battle fleet in divisions as organized at present?

Ans. The reserve ships should by all means go into the war battle fleet, in the first fighting line, wherever by doing they will aid the other ships of that line. They should go in with their proper squadron and division numbers. The qualities that determine their status are tactical qualities, viz., speed and power.

(2) If not, should the Atlantic reserve fleet form a separate organization?

Ans. The Atlantic reserve fleet, as such, would have no being in war. It would either pass its units into the war battle fleet or into the war reserve fleet. Even the war reserve fleet, though it is an organization of itself, should be subordinate to and under the direction of the commander-in-chief of the war battle fleet.

(3) What disposition should be made of the several types of ships in the Pacific reserve fleet?

Ans. In war there will exist no Pacific reserve fleet, as such. There will be but the one war battle fleet and the one war reserve fleet. If, through any chance, units of these two fleets become separated from their own main bodies, they will still be but parts

of those bodies, either doing distant service, or separated through misfortune. All ships that can be of assistance in the first line should operate with it, and this the armored cruisers and more powerful cruisers can do, particularly as fast wings, scouts, torpedo leaders, etc. The other ships can then find their places in the war reserve fleet. Any ships that have no place in either of the two fleets may still find a place in the auxiliary fleet, The station for all other ships is the scrap heap.

(4) What should be done with the reserve torpedo-boats on each coast?

Ans. This question is similar to that just given above. There should be but one war reserve fleet comprised of the torpedo groups on each coast. A new and increasingly important duty for these small craft will be in conjunction with or opposition to submarines. The harbor defence type of submarines and the torpedo-boats not capable of extended service should be in the war reserve fleet.

There may occur times when some or all of the component parts of the war reserve fleet may be needed by the commander-in-chief of the war battle fleet, but if the same conception of the relations existing between the battle and reserve fleets be held as stated above, the closest harmony and unity of action should result. The task of administrating those units that plainly cannot assume positions in the war battle fleet is removed from the shoulders of the commander-in-chief, at the same time the established relation of the reserve fleet to the battle fleet gives him the power to use all or any of its units whenever and whereever necessary. Such a relationship will permit the most thorough coordination and harmony of effort.

When the question previously arose as to whether there should be two active battle fleets, an Atlantic and a Pacific, it was settled, as was thought, once for all. There should be but one. That principle was maintained and held to be sound for the active fleet, whether it be on a peace or war footing. The reason it is sound from a peace standpoint is because it maintains the navy in a "Position in readiness in full power." But the moment the term "reserve" was used there seems to have been a lack of appreciation of fundamental principles. If the conception deduced from an analysis of the military relation between active and reserve fleets be sound, then there can be no separation of principles. The

two fleets for war, the battle and the reserve, are closely, intimately related to each other, and the military principles that guide the one should always guide the other.

Incidentally, we may sometimes wonder why such apparently simple principles should not long since have been recognized and acted upon. It is because we naval officers are very human; because, like almost all men, we were born conservative; because being prone to believe that what is must be right, we naturally shrink from the birth pains of a new idea.

We are all of us largely victims of our environment. We are all small parts of a system, or what passes for a system. Unfortunately, our entire naval system starts with its viewpoint at the detail end, and not the basic principle end. Habit and law have established this, and training along the lines of the system only tend to fix the idea more firmly in our minds. It is not the fault of the average man, it is the fault of the system, and it reaches from the bottom to the very top. This fault exists because the principles of a sound military organization have not yet been applied to the naval service. There does not yet exist in the whole service an organized body of men who have the power to act and who have been trained in the art of waging war on the sea, the one fundamental thing for which the entire naval establishment exists.

Until this fundamental principle is recognized and applied, we can never do more than make the best of conditions as they actually are, not as they should be.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TRAGIC DAYS OF VERA CRUZ[1]

THE FIRST PUBLISHED NATIVE ACCOUNT OF THE SEIZURE OF VERA CRUZ BY THE U. S. NAVAL FORCE UNDER REAR ADMIRAL FLETCHER, U. S. NAVY.

Translated by COMMANDER R. W. MCNEELY, U. S. Navy.

It was eleven twenty yesterday when alarming notices, which had been in circulation a few days past, again began to be circulated in regard to the armed intervention of North America. This was crystallized into a formal disembarkation of forces of that nation in our port.

A Frigid Moment.—After a brief preparation the contingent of armed Americans took up the march toward the city in the direction of Calle de Montesinos. The platoon of seventy armed men from the *Florida* started toward the edifice of the telegraph building, which they took possession of without encountering the slightest resistance and placed men there inside and outside. The rest of the American force, divided up into groups of fifty or more men, were stationed at the corners of the following streets: Morelos and Benito Juarez, Morelos and Emparan, Montesinos and Pastora, Montesinos and Independencia, Montesinos and Cortez, Montesinos and Bravo, and Montesinos and Hidalgo.

Resisting the Invaders.—When the American forces came to the corner of Morelos and Emparan they received the first discharge from a small group of Federals, who were lying down awaiting the invading force at the corner of Independencia and Emparan. From the moment that the invading force opened fire with rifles and machine guns the streets were cleared. Notwithstanding the lack of chiefs and officers on the part of the Federals their fire continued incessantly, although it was weak and intermittent.

The First Destructive Shots.—About three in the afternoon a field piece was disembarked and at once placed in battery by the

[1]From *La Opinion*, Vera Cruz, April 23, 1914.

Americans. Their first shots were against the tower of the old Benito Juarez and damaged it greatly. Without being able to corroborate our statement, it is said that this was done on account of the firing from it of several volunteers. Shortly after four in the afternoon the platoon in charge of the above named piece left their first position and took up position in the patio of the Terminal Station and turned their piece toward the Custom House. About five in the afternoon a force from the *Utah* advanced to the Custom House firing on the space between the Hotel Mexico and Hotel Oriente where several individuals dressed like volunteers opposed their advance by firing rifles and pistols.

The Attacking of the Fatal Circle.—After half hour of terrible fighting the American force named above took possession of the Custom House, as was the general belief, but it was at the corner at Calle Lerdo and Morelos where they placed the piece in an open position which they could use for firing better against the volunteers and the Federals who were making their resistance from the roofs and columns of the Diligencias, Universal and Aguila de Oro. This force without doubt caused the greatest number of deaths between combatants and noncombatants which were, with the Federals, a matter easily explained because the fighting had brought together at this place the largest number of persons. The principal officers of the American force determined to erect trenches in the streets and a detachment was placed at the corner of Emparan and Morelos to destroy the door of the merchant shop of the Spaniard Varqui, out of whose store they took a number of sacks of corn, coffee, and beans to form the trenches and barricades. In this same place the Americans also took various kinds of eatables, like chocolate and muscatel. About six o'clock in the afternoon the firing became less intense, but, however, rifle and machine gun shots were directed toward suspects who crossed the street guarded by the Americans.

In the Terminal and Prominent Points.—The American forces disembarked, notwithstanding other rumors, did not rise yesterday over more than a thousand men. They established their hospital in the waiting room of the Terminal Station, and the armed forces bivouacked during the night in their respective positions. The gunboat *Prairie,* which landed the first armed forces between three and five in the afternoon, fired several shots, it was said, on groups of Federals and armed citizens who were going toward the

outskirting sand hills. At night-fall, in order to exercise greater vigilance over the center of the town, where the Federals were stationed, a number of the " Panama " battalion [U. S. Marines.—ED.] were stationed on top of the Hotel Aleman, situated at the corner of Independencia and Montesinos.

Activities of American Reporters.—The activity and great number of American reporters, representatives of the New York Herald and World, and Cinematograph Company, whose name we do not know, stayed during all the day and part of the night exercising their respective callings; also Messrs. " Chato " Franco and William J. Lamont, from this place, going here and there in the search for happenings for their respective papers. At the disembarkation of Americans, the Consulate of the United States was full of Americans trying to save their lives and some of these had come the same day from the Capital and other points of the Republic. On account of the quickness of the warlike move they did not have time to embark on the Esperanza as they desired. Part of the American refugees, who at first stayed on the balcony of the house occupied as the Consulate in Morelos Street, had army rifles of their country, which undoubtedly were given to them to defend themselves against the aggression of the Federals.

An Incident.—In the patio of the old Mexican Station was apprehended by a group of marines a man named Justo Rodriquez. He was thought to be a spy of the Federals but others said that he was an employee of the government at the telegraph office. This individual was taken into a room of the Terminal Station and by means of an interpreter he was subjected to a minute examination, but without being able to prove the charges.

Re-enforcements.—On the morning of to-day four new American ships arrived in the port.

Their invading forces were sent ashore for re-enforcements, forming a total of approximately thirty-five hundred men, with four field guns, ten machine guns and three automatic guns. About fifteen hundred of these troops started toward the Naval School where it was supposed the greatest resistance would be encountered.

The Achievement of the Scholars of the Naval School.—Passing behind the edifice of the Custom House and crossing the Sanitary Mole, the column of attack slowly, and with careful look-

outs, came in front of the Naval School; there they received a terrible discharge of firearms which made them retreat semi-dispersed. The largest part of this force was made up from the Panama battalion. Having found the place where the defenders of the town were making the greatest resistance, the American battalion mentioned broke up into a line of skirmishers which extended from the Sanitary Mole, and opened up a hot fire on the Naval School lasting forty-five minutes.

Destruction of the Edifice.—The cruiser *Montana* [*Chester.*—ED.] of the American fleet noticing the quick retreat of the marines, and also on account of the strategic position in which she was anchored could fire easier than any other of the American ships, began to fire shells against the edifice from which came the fire. She began to shoot with great precision a rain of explosive shell over the school and shortly stopped the fire from the school. The Americans dragged their field pieces up to one side of the line, and, aided by the shells from the *Montana* [*Chester*] and *Prairie,* opened a simultaneous fire against the institution and one of the pretty chalets near the lines. From both places shots were being fired against the Americans. The balcony and great pieces of the houses were destroyed and columns of smoke and dust shut out vision for a while. The small discharges from the edifice added to the formidable fire of the ship's guns and field pieces. The fire of the Federals and the volunteer defenders of the town in the attack on the establishment mentioned above was very severe. The American force that was on the Sanitary Dock lying down, remained waiting about thirty minutes, at the end of which, having received no reply, took up their march toward the center of the town, always on the lookout. Each soldier was a true Argos.

Cease Firing.—Entering the heart of the city the American force broke up into small sections, following the streets [Calles.—ED.] Lerdo, Morelos, Betancourt and Arista. Only a few shots were fired on the assaulting forces from the roofs of the Cafe Diligencias, the tower of the Cathedral, and from the right side of the Correctional Prison, where it was thought some shots were fired, but, as a matter of fact, this was not true. The assaulting force took possession of the Municipal Building and all the sidewalks surrounding the Plaza de Amaras. The formal attack, which began at 7: 55 a. m., ended at 9: 55 a. m. with the taking of the Government House and the principal edifices in the center of the city.

Liberation of the Prisoners and the Locking up of the Jailers.—A platoon of bluejackets from the *Utah,* which entered quickly into the Correctional Prison, demanded the keys of this prison and opened the doors wide, giving liberty to the prisoners with only a promise from them that they would clean the streets of the city, carry off the dead bodies, and aid in moving merchandise. Señor Cevallos, also his assistant in the prison mentioned above, were provisionally made prisoners, but an hour later were placed at liberty, after having obtained from them certain information relating to the local authorities.

Assault on the Cafe Diligencias.—Another enormous group of soldiers, accompanied by bluejackets without any names on their hats and with them some soldiers from the Panama battalion, ran through the doors and windows of the Cafe Diligencias, breaking them down and entering the edifice through these large breaches. Suddenly collecting everybody they made a minute examination of the building from bottom to top. We left our place there in order to go into the Hotel Universal, but the door of this place was broken down because of the delay in opening it by the owners. In one workroom of this hotel, with cartridge box empty and his face livid, pale, and swollen, they found one of the Federal soldiers of Battalion 190. He had fired with resolution against the Americans. The squad which found this man handcuffed him and with great rudeness marched him to the Municipal Prison, where he was locked up in a room for better security.

The Examination Continues.—While another part of the invading force had possession of the Hotel Diligencias—they examined minutely each and every one of the guests found there and these were put on the lower floors of the edifice in order to carry on the further examination of the rooms which the guests occupied. After that they examined the guests themselves. This operation took about one hour and a half, at the end of which the officers who commanded this force decided, it is said, that a wounded man, whom they found in the hotel, should be taken to the Custom House, where he would be entered and attended by the American Hospital Corps.

In order to make a small digression, we have to say that in the new Hotel Diligencias there took place an unheard of occurrence which might have occasioned a multitude of innocent victims. It appears that, from one of the upper rooms of this hotel, during

the greatest confusion and firing on the Americans, there appeared to come some shots which wounded some government soldiers, placed around this establishment and behind the columns of the arches. The Federal lieutenant, who said that he was obeying the orders of his chief, was stationed at one of the doors, and tried to make all the guests come before his colonel, whom we have said was stationed in the door of the Diligencias Cafe, through which the unhappy guests passed, insisting upon their crossing the Calles Lerdo and Independencia down which was passing a death hail of machine gun shots. By the providential intervention of a distinguished doctor-senator, who was greatly injured by the Government of General Huerta, the guests were saved from sure death.

An hour after the American forces had taken possession of the center of the town, a small squad provided with machine guns and field guns advanced toward the Federal Prison and the Military Commandant's Office, which they attacked without any resistance, making prisoners of a few Federals who were found there. It has been assured that in the Military Commandant's Office the Americans found a quantity of military stores which had not been removed by the chiefs before abandoning the edifice.

Bombardment of the Santiago Bastion.—With the capture mentioned above there only remained the Bastion of Santiago and the Military Hospital uncaptured by the American forces. This bastion only fired two shots and the trajectories of these have not been able to be traced. The cruiser *Montana* (*Chester*) fired into this bastion two explosive shells, which destroyed it and gave to the assailants the surety that it did not contain a possible enemy.

The Patrols in the City.—Patrolling the streets, the Americans examined the houses in search of arms from eleven in the morning until six in the afternoon, taking great quantities of rifles, carbines, pistols, and shot guns from the shops of Mulsera & Co., Witter, Torreon & Son, and also from various commercial and private houses; also, quantities of these arms were placed in small carts which were pushed by the owners of the arms into the presence of the superior officers installed in the Municipal Building.

Surprises to the Invaders.—When one of these inspecting patrols was coming through the streets and when it arrived op-

posite the Military Hospital at its lower end it received a hot rifle fire which was replied to by the squads up to Calle Hidalgo. The officer sounded his whistle for help. There immediately came on the scene a large platoon of American troops which took the hospital.

The Reason for the Force in all its Bareness.—It appeared there was an idea that some of the military chiefs of our armed forces might be concealed in these buildings; and, in order that the city might return to its normal state and open all commercial houses which remained closed, these inspecting squads were sent around. When the inspecting forces called at some of these houses for the purpose indicated and the doors were not immediately opened, they were immediately broken down by axes. It was said this was done at the branch of the hat shop Valdes, situated at Lerdo and Independencia; also at the "Paloma," a shop situated on the principal street and also the barber shop "La Moda." The precautions observed by the American forces in order to stop possible aggressions have reached, in some of these cases, the very limit which legally could be permitted armies of occupation belonging to a civilized nation, as America calls itself civilized in the highest spirit. In regard to this matter we desire to be permitted to call it to the attention of Mr. Canada, known among us. There were patrols which exercised their functions in the town to the very extremity, pointing their guns at passers-by, saying "Hands up," which many of our inhabitants did not understand and subjecting them to death for unjustifiable lack of knowledge of a strange language. Those in charge of the cars which the American force used, in order to carry out the examination of the houses, went about with pistols in their hands, carrying their arms like a hunter would in the middle of darkest Africa; and all this after a formidable military domination of the town, when there was no justifiable cause for aggression or fear on the part of the American soldiers.

More Elements of Landing and Seizure.—At the last hour, the American naval force anchored in our bay had been reinforced with new first class ships, cruisers, and transports, also an augmentation of artillery for the field forces and other guns, some of them to be employed in the vicinity of the sand dunes; also bluejackets and marines amounting to 5000 total. Locked in the most serene judgment, always compatible with pure patriotism, we

embrace with feeling our national interest. Let us exhort our people to the adoption of a line of conduct free of impudence and insolence, and wait, with the belief that we have not given cause for unhappiness to a whole country in their national conflict, which is aimed principally at a President and not a people.

Written from our Office.—The wounding of Señor Louis Cabrera happened on the first day of the firing by imprudence, we are sorry to record, as follows; Don Louis Cabrera standing near the owner of *La Opinion* came to the door of the Diligencias about four in the afternoon. He began to talk with one of the officials who was fighting when he felt as if some one had struck him on the left hand. It was a spent bullet probably fired from a pistol from a balcony near by. Another projectile fired a short time later killed the officer to whom he was talking.

The Danger of the Convicts.—On account of the scarcity of the forces to form the guard, the military commandant was obliged to use extreme measures, one of which was to use the wounded men from the Military Hospital and also the prisoners from the Municipal Prison and also the Military Prison. As the last were clothed in a cotton uniform with circular bands the people called them by the name of " The Stripers " to identify them. We have to say, however, that these " stripers " occasioned great alarm and committed a great many robberies during the night. As they were given liberty they were armed with Mausers and Winchester rifles, and, their cartridge boxes filled, they began firing right and left down the street and when any of the inhabitants came out on a balcony to get a breath of air and to stretch their legs they were fired on by these " stripers." Here is a happening which made one think of the Tartars: One of these ferocious beasts fought with a husband for the possession of his wife and killed the husband and wounded the woman who resisted his brutal appetite. This incident took place in Calle Lerdo.

The Sacking of a Shop.—The greatest group of the brave " stripers " robbed the Crystal Palace, property of the Señor Reveille, situated at the corner of Independencia and Betancourt; the loss was small consideration, but the damages to the appointments of the shop were great.

The Searchlights of the Ships.—All Tuesday night the powerful searchlights of the *Florida* and the transport *Prairie,* lighted up an extensive zone in the eastern part of the city, extending

towards the sand dunes and towards the Castle Del Mercos and up to the Mexican railroad. Some curious light effects were noted on the sand dunes. The city remained very much disturbed on account of the firing of the "stripers."

The Second Day.—The combat opened again to-day, Wednesday, at 4:40 a. m. with some scattering shots followed by various discharges of small arms. The firing of the large caliber guns shook the walls and rooms of some of the houses. The machine guns were heard for about half an hour, and the light and distinctive shots of the Colt guns were easily distinguished. At half past seven in the morning there was half an hour of "cease firing," which many people took advantage of in order to buy flour, beans, etc., and things in general, and at this time some merchants decided to open their stores for a few minutes.

The Shooting up of the Tower.—[Formerly a convent.—ED.] It was noticed with profound disgust on the part of the people the advance of the North Americans towards avenues Morelos and Zaragoza and their defiling into the street at Betancourt; there followed several shots of large cannon which were considered to be from a ship. At eight in the morning two projectiles caused enormous damage to the tower of St. Augustine, used to-day for a storehouse of clothing. The lantern of the tower was destroyed.

What our Reporter Saw.—Among the defensive activities, and there were many, because in all the squares of the town there were soldiers of the small garrison and also volunteers, there was one done by twelve Federal soldiers which deserves attention. These placed themselves on a roof near the corner of Benito Juarez and Montesinos; they carried on an extensive fire against the American soldiers, remaining in their position more than 20 hours, leaving it only to charge their rifles and in order to eat a few pieces of bread given to them by the inhabitants of nearby houses. Of these soldiers six or seven were terribly mangled by the machine guns of the invaders. The survivors, when hostilities terminated yesterday about ten in the morning, were taken by the North American patrol which commenced to go over the city. Before locking up the prisoners they broke up their firearms int small pieces.

Wounded and Dead Collected.—Many wounded and dead were collected by the Red and White Cross; also by the same means by the Americans, but it is not possible to give even an approximate

number of the victims collected. However, we can give the following reports from the hour at which the firing was opened day before yesterday: The Administrator of the Post, Don Muñoz, who is a colonel of Cavalry, crossing over the street intersecting Independencia and Cortez in order to present himself to the Military Commandant, was wounded in the leg, falling immediately; happily he was carried into a nearby house, where he was concealed by the owner who attended him, and later he was carried to a hospital where he is reported on the way to recovery. The bullet passed through the back part of the femur. It is not grave, however, though it touched the bone. A gentleman who calls himself Don Pancho, owner of an arms shop in Calle Cortez, a few yards from the park, looking out through curiosity was struck by a bullet in the stomach and, we have been assured, died while they were carrying him to a hospital. At the crossing of Independencia and Lerdo there remained a body of a soldier 20 hours and he was removed after the termination of firing yesterday. In the new beginning of Calle Cortez, in the square of the canteen San Javier at six in the morning yesterday an officer of the 19th battalion received a shot in the left lung, being badly wounded, and was gathered up by the Red and White Cross. Many of the bodies could not be identified because it was impossible to take their names and also because it was necessary to care for them rapidly. A lieutenant of artillery, named Azeueta, shot for a long time a machine gun, manning it with great valor against the Americans. At the end, the heroic young man fell gravely wounded with both legs and an arm shot through. He was taken to a Red Cross Hospital established in the fire house and from there he was taken to the sanitorium of Dr. Curro, where two of the doctors, Curro and Roheus, operated on him. A young man, Himinez, who also fought with valor, received a bullet of a machine gun in his foot which was horribly wounded. At the corner of Guerrero and Zamora, a Federal second sergeant was killed and the body remained there abandoned until this morning when it was buried by the Red Cross.

The Red Letter Day of the Cadets of the Naval School.— Several times we have spoken with eulogy of the resistance given by the cadets of the Naval Military School. These young cadets maintained their position up to seven of Tuesday night, firing numerous times from the doors and windows of the edifice, half

covered with mattresses and room furniture. In the fight there were several young men wounded and only one killed, Cadet Uribe. Commander Carrion, First Lieutenant Delroso and Officers Lopez, Quevado, Bonelie and Maqueo headed a group of the young men, and have made for our history pages similar to those of their brothers of Chapultepec. When night fell, it is said, they received the order to abandon the school, which they did in perfect order, going out to unite themselves with the Federal forces by the Alameda, where they were lost sight of on their way to the Laguna.

The Unknown Heroes.—Yesterday, in the morning, some volunteers and soldiers of artillery made a resistance in the Artillery Barracks at the Avenue Lerdo and Cos, seeing which the American ships opened a terrible fire on the Naval School and the Preparatory College and both of these edifices are now in a very bad state. There is scarcely a room which does not show great damage; also the nearby houses suffered. Yesterday, in the afternoon, the streets in this locality were filled with blood and several dead and wounded were in the houses nearby, which were collected by the Red Cross, whose work is highly commendable. A reliable person, who saw it, has informed us that Lieutenant Colonel Contreras, who was instructor of the yolunteers of this port and who was scarcely six days in possession of his post as Secretary of the Military Commandant, was wounded in the shoulder in one of the doors of a house in front of the Plaza Del Constitution and at present it is not known what has become of the lieutenant colonel. Some say that he is dead on account of the wound, but on account of the fact that everything is in confusion and the vigilance of the American soldiers is extreme, we cannot tell what has become of this military chief.

Damages Caused by the Firing.—To the damages caused by the shells of the American ships to the buildings of the Naval School and Preparatory College mentioned above, we have to add the following, which we give without special order: Two shells passed through the shop of La Nueva Bronce [The New Bronze] causing damage and wounding the owner Don Ruyriz and also a lady. One of the shells passed through a door and entered a nearby butcher shop. The other shell, entering the same place, passed through the patio, and struck the chicken coop of the house, killing all the chickens belonging to Don Exposito. The

shop La Guerda had a few damages done by the mausers of the Federals. The shop Montaña was struck also. In an edifice between Progresso and Zaragoza a shell struck; fortunately it did not cause any damage. Near the sand dunes also fell several shells which did not cause any unfortunate results because they fell in depopulated places. In Calle Allende and Progresso two shells struck, one of which exploded at the corner of the prison where the court of one of the judges of the first criminal instance is held; the other perforated and broke a table in a shop. At the corner of Progresso and Guerrero one shell fell which perforated the electric light post and killed an individual named Queridas. Many houses of Calle Progresso were struck by shells; in the shop La Dinimita [Corner of Calles Bravo and Juan Soto.—ED.] a shell destroyed one of the doors completely; also another shell broke in the door of a bar-room nearby.

Complementary Notes.—At the corner of Progresso and Hidalgo, a dead body was found with the head completely destroyed; a little before that, on the same square, were found three other dead persons killed by spent bullets. Many families, as a precautionary measure, went outside the city on account of the rumor given out that the North Americans had given two hours time to clear out the city, which was going to be destroyed. Many patios were abandoned because the inhabitants feared that the mausers and shells of the ships would destroy them. Many families took refuge in the cellar of the house of Señor Valdés. Because the North Americans had established a most rigid vigilance in the eastern part of the city, obliging men and women to pass beyond Calle Zaragoza, it was impossible to know with precision what had occurred. The parts of the city to the east, all the streets of Lerdo up to the end, are patrolled by squads of soldiers which go and come up to the Police Station on out to the sand dunes, where there was established about nine this morning several field pieces which we can see from our office. Early to-day several American soldiers got horses and small cars for their military service, in order to carry stores to the soldiers, and they have established out near the sand dunes an advance guard. The major part of the people in the city who lived in the outskirts of the city or who are suspected, are examined by the patrols, and if they have arms they are apprehended and conducted to the Police Station and after a short while are placed at liberty. One of the

patrols accused young Louis Rosas, as we have been informed; he was detained because he was found to be armed. We do not know whether he was placed at liberty at once in the same manner as the others.

The Sale of Food and Other Articles of Prime Necessity.—Although at present a few shots are heard coming from the roofs of houses, especially in Calle Landero y Cos [Landero y Cos is *a* street not two streets.—ED.] it is said that in a square in this locality are concealed some soldiers and volunteers whom the Americans are trying to apprehend. The rumor is to the effect that they have not been found, notwithstanding that several houses have been searched, and that the square will be dynamited, and that, before this is done, the American forces have determined that the merchants of several shops there will be obliged to distribute food and articles of prime necessity to all the people that live nearby. Up to the moment of closing the present edition, this dynamiting has not occurred; and there is another rumor to the effect that several ambitious merchants, in order to take advantage of the confusion which came at the disembarkation of the North Americans, have raised their prices to an exorbitant figure. This is the talk heard most insistently and which has caused the American military authorities to order the general distribution of the food and other necessities, in order to punish in this manner the avarice of the speculators. The truth is, if they have attempted to do such a thing, they very well merit the punishment meted out by the Americans. We have to say that some bakers yesterday took occasion to sell their bread very dear which is certainly a most unpardonable abuse.

The Last Hour.—Information which we have from various sources says that in Tampico nothing abnormal has happened and that the North American forces have not disembarked as they have in our port. It is certain that the only port subjected to the domination of the military forces of the country to the north is Vera Cruz.

Train Covered by English Flag.—When the present number of our paper was going to press there was a rumor in circulation that there will arrive a passenger train from Mexico City, with many foreign families from the interior of the Republic and other places where there is a fight against the Carranza rebels; many have concentrated in our metropolis in order to embark and get

out of the country. It is said the largest part of these people are North Americans. In order to get them best means have been taken to cover them with the English flag and they have come to the station of Tejeria, which is distant from our city 16 kilometers. The covering of this train by the English flag was done on account of the acute situation, and the fact that the troops of the country to the north are in possession of our port. If this train had been covered by the banner of the Stars and Stripes, it might easily have been attacked enroute by the Federal soldiers which abandoned this city day before yesterday and who are probably encamped near the city.

A train was prepared at the terminal and sent out to meet the refugee train from Mexico City. This was done only on the supposition that the track had been torn up between Tejeria and Vera Cruz, but there is an insistent rumor that the Mexican railroad has been cut in order to complete the defense against the North American forces in case they should take this way in order to get into the interior of the Republic.

FROM OUR EDITION OF YESTERDAY (21ST).

The diplomatic relations which Mexico and the United States had began were broken on account of the insolence brought to a head by the attack of the force at Vera Cruz, and for which the White House gave grave importance in order to controvert it into a reclamation. These could not give any result on account of the pressure of the United States to intervene in Mexico.

Intervention.—This fatal word which follows us in history and which we hear whispered every day and every hour when we see ourselves involved in a new revolution. All day yesterday the multitude continued to be alarmed on account of the presumed arrival of the Atlantic squadron of the American fleet, when it was heard that they were not proceeding to Tampico but to Vera Cruz. A great number of telegrams were received from American citizens asking for rooms in this port, and at night the Mexican railway brought numerous foreigners. The first hours of to-day were very emotional because of the suspicious movements which were noted in the American fleet. When work began in the Federal offices the chiefs received orders to hold their employees ready to resist invasion. It was thought that the invasion would not take place immediately and everybody went

about their work as if it were a false alarm. Mr. William W. Canada, Consul of the United States, showed to his colleagues of the port a circular in which he announced officially that the North American squadron of the United States would arrive at Vera Cruz at two in the afternoon. An alarm immediately took possession of the city, and everyone feared an attack. The face of things changed at ten in the morning, at the hour at which it was understood Consul Canada issued his circular and the suspicious movement which had been observed in the bay began; then all the public schools let their scholars return to their homes. The branches of the National Bank, London, and Mexico, and the Mercantile Bank of Vera Cruz, all the large merchant houses and all the offices in the center of the town were closed on account of the influence of the alarm which had seized the city. Everyone went to his own house.

The Federal Offices Closed.—Also at ten o'clock sharp in the morning the Federal offices of the Custom House, Telegraph and Post-office were closed, but the employees expressed a desire to take arms in case of an attack from without. The office of the Treasury was the last Federal office which remained open, but they also dismissed their employees and closed their doors one hour later. General Maas, we understand, only left last night taking with him the rest of the Federal forces, and there was not more than a hundred soldiers and volunteers in the town.

The Intervention of the Men From the North.—With a heart gripped with sadness we write these lines. At eleven in the morning, the fatal hour, the launches sent out from the *Prairie* secured to a buoy in the center of the bay, took about 500 men of the North American marines dressed in khaki color, some with seamen's caps and others with hats with wide brims armed with rifles, cartridge boxes and blankets. The disembarkation took place on the Porfirio Diaz dock [The Ward Line docks.—ED.] and there was not the slightest resistance offered to the invaders. There were a few men working on the dock; some of these raised their voices in protest or whistled. Sailors formed at the small plaza by the Terminal Station and after taking up different directions prepared to use their arms.

The Terminal, Telegraph Office and Post-office Occupied by the Invaders.—Part of the above mentioned force which first disembarked went to the American Consulate situated in Calle

Morelos, at the side of the Terminal Station. The other party took station on the hotel, covering the roof, stairways and balcony and establishing guards in the doors. The major part of the forces went up to the telegraph office and some of these up to the Custom House—this without receiving resistance—occupying stairways, part of the second story and roof and establishing some squads near the Fiscal Mole and other points of the bay. There was no resistance in these places because it was presumed that the true gravity of the case did not warrant it. Launches of larger size followed, transporting bluejackets who were seen to disembark, those of the *Florida* and *Minnesota* [*Utah*] in larger numbers than were disembarked from the *Prairie*. These occupied the Avenues Morelos and Emparan in order to extend their lines up to that point of the railroad corresponding to the opening on Calle Cinco de Mayo, and occupying other avenues in this locality near the bay.

The First Train.—In the first moments of the attack the Mexican Interoceanic, from Alvarado to Vera Cruz and to Tejeria was paralyzed because the invaders took the locomotives and cars and guarded the rails up to the Laguna Road. Also the electric tramways were paralyzed, but the telephone service remained in working condition.

The Combat Begins.—The North American forces at Calle Cortez up to the Park Ciriaco joined with the other two columns and took possession of the Mon. Señoras and acted as reinforcements at the Terminal Station and protecting the large edifices of the post-office and telegraphs by placing squads in the far end of the small plaza which forms extensive lots in the section near the sea. This was the zone which the invaders occupied when they heard the first shots which came from the Federal garrison divided in various columns of attack. They took possession of this zone without opposition including the streets Lerdo and Independencia and all of the Plaza De Armas and had possessions limited as follows: On the east by the Municipal Palace, two regular floors with a good roof top position; on the south by the Parochial Temple, which has a tower of two sections and wide cornices; also on one of the private tenements; on the north the two edifices of the new Hotel Diligencias, Hotel Universal, and other private commercial tenements, both of those having a magnificent front; on the west with only the old Hotel Diligencias, three floors and an attic, having a beautiful arcade in the lower

part, which is the best part of Vera Cruz. Thus it is seen that the plaza is very defendable if it contained many soldiers, and more so, if it had machine guns, because if these are stationed in the angles of the house tops the assailants could be covered at all points.

The first shot given by the Federals was about ten minutes past twelve and the invaders did not make a movement with their first line until they came abreast the street of Benito Juarez.

It can be stated that at two in the afternoon the fire had become general and there were shots of machine guns and cannon.

The firing slackened up at three in the afternoon but began again with vigor and with excessive detonations like a storm in which the machine guns and the mausers could be distinguished. Sharp at 6:00 p. m., the battle opened up anew without the invaders having advanced a single line, the invaders not having been successful in taking a single central point of the plaza. At seven at night there were heard a few discharges but the battle was dying down and a shot here and there was the last fragments of the fight which has polluted our streets and held up our rights as a sovereign country.

The Last Hour.—This edition which was prepared in order to circulate it in the early hours of to-day, if the firing permitted, but, owing to a lack of power, our press could not print the edition until four o'clock in the afternoon; also there was lacking the principal details of the happening in the minute narration made by one of our reporters, who was present in the Federal telegraph office, and was made prisoner. Consequently he should appreciate better the battle in all of its aspects.

It is best that the people should calm themselves, because nothing is going to happen to the city. In order to rectify the data given above we must state that the resistance of the city was mainly done by volunteers and by the cadets of the Naval School and the National Guard formed by citizens in civil life. Now, we should act with great prudence in everything in order to prevent examination and domiciliary visits. We write this taking into account the reading of the manifesto of Rear Admiral Fletcher in which he invites the civil employees to return to their positions and says the military authorities will not interfere with them. Private persons will be respected and all classes of guarantees will be given provided order is kept; also that the taxes will be received as custom-

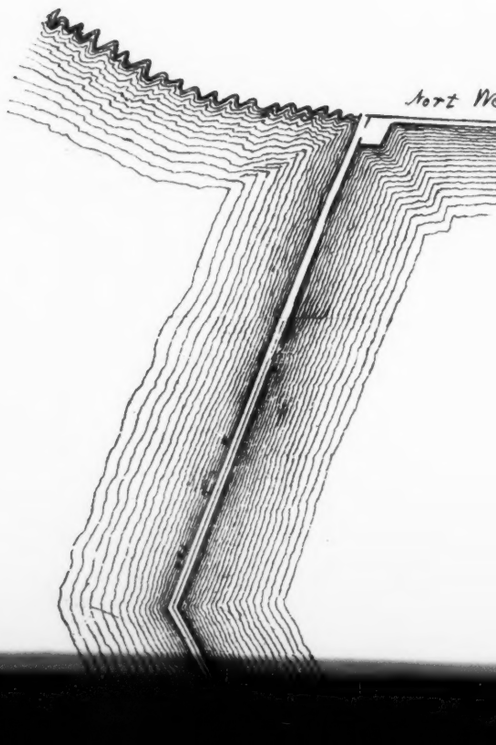
ary, merchants must reopen their negotiations, counting on maintaining law. This document was circulated in English and Spanish.

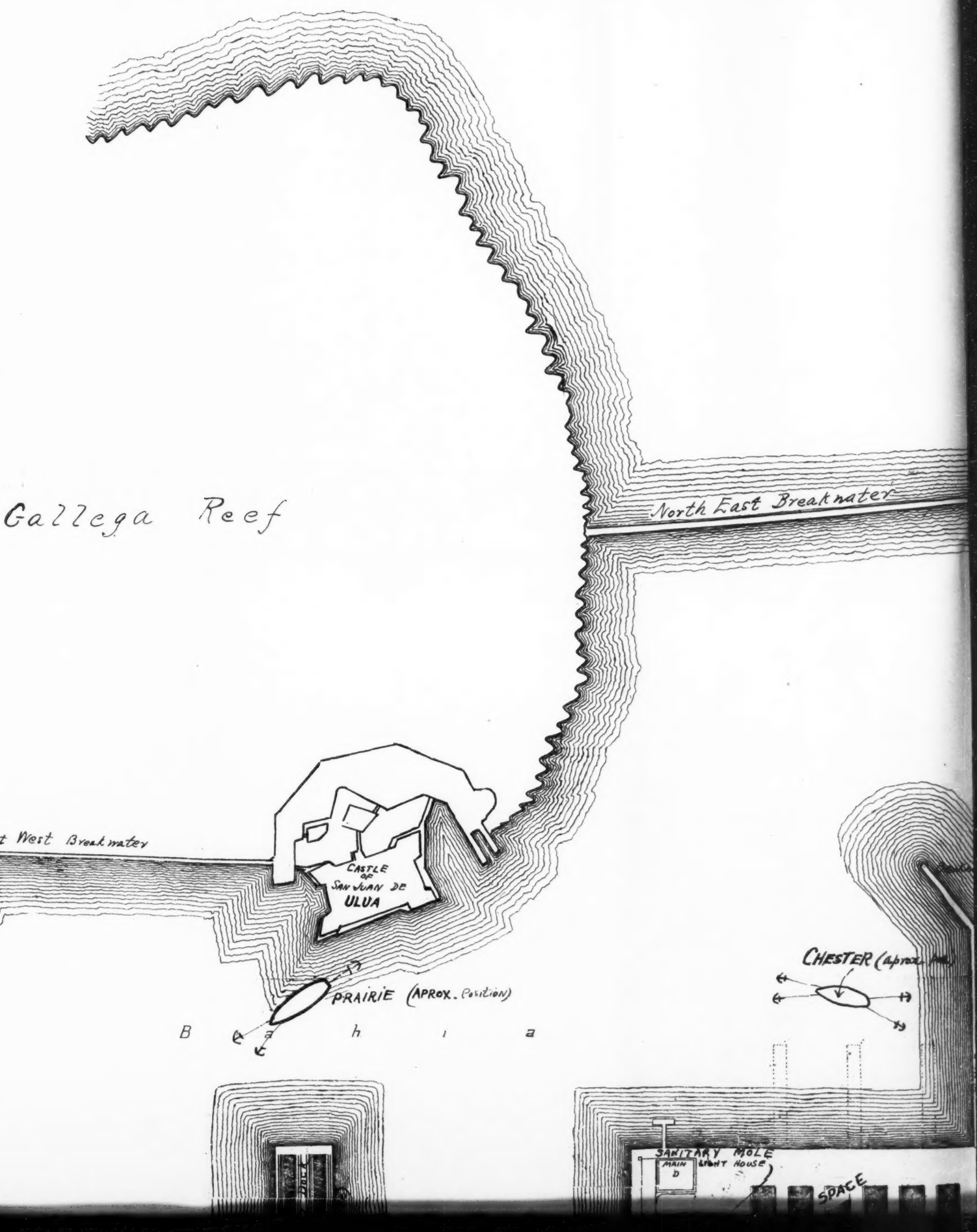
Seen From Our Office.—There also passed in front of our office a cart of the Red Cross taking a tailor by the name of Pedro Lerado who was wounded in Calle Cortez; this man we saw passing shortly before, somewhat under the weather by alcohol, crying, "Viva Mexico."

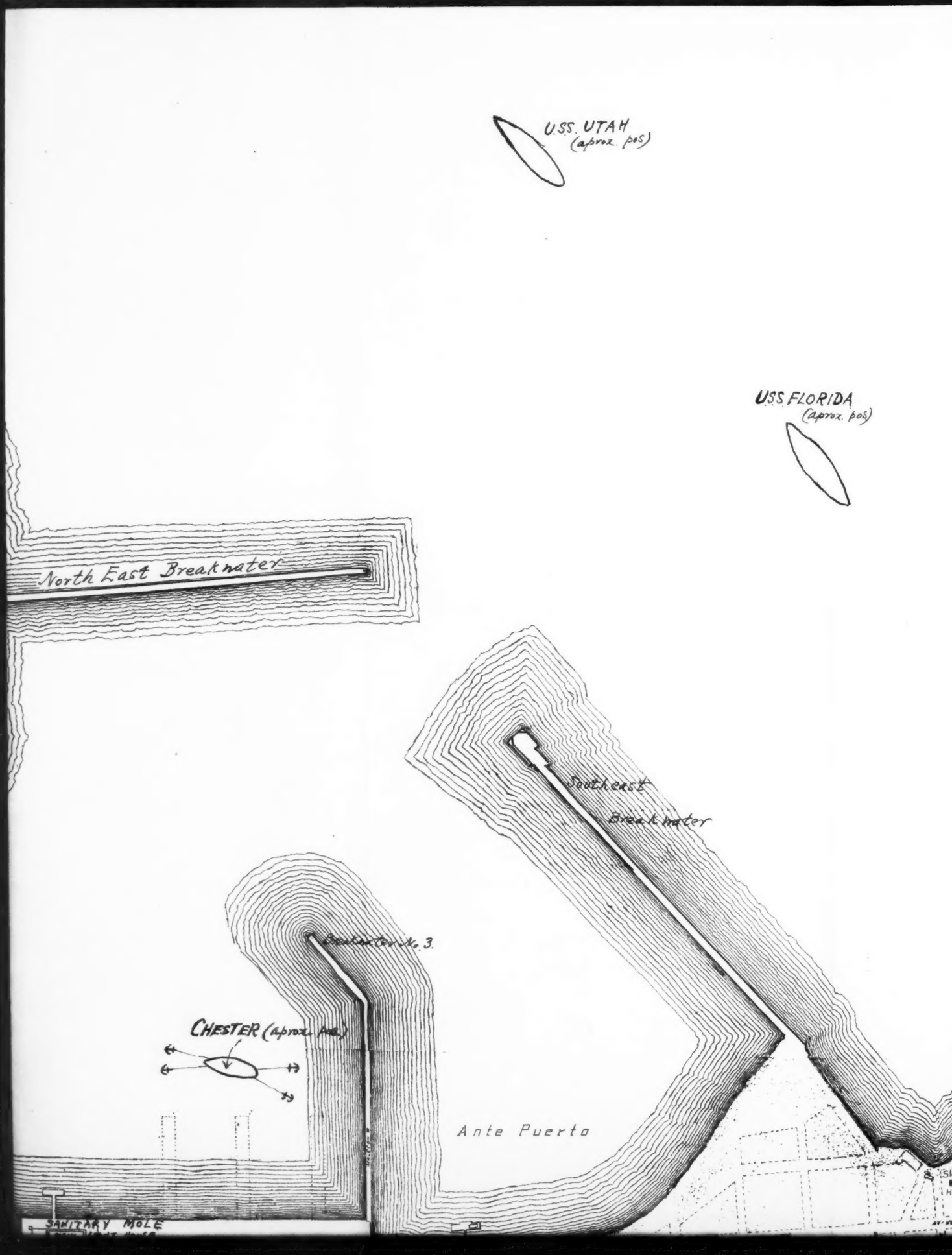
PLAN OF THE HARBOR AND CITY OF VERA CRUZ

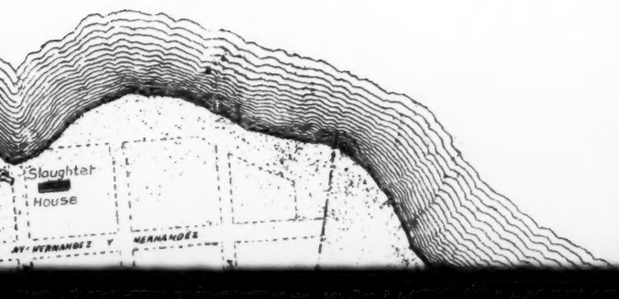
With

Approximate positions of the U. S. Men-of-War under the command of Rear Admiral F. F. Fletcher, U. S. Navy, at the capture of the city, April 21-22, 1914; also, prominent points in the city mentioned by "La Opinion," made by Commander R. W. McNeely, U. S. Navy, U. S. S. Louisiana.



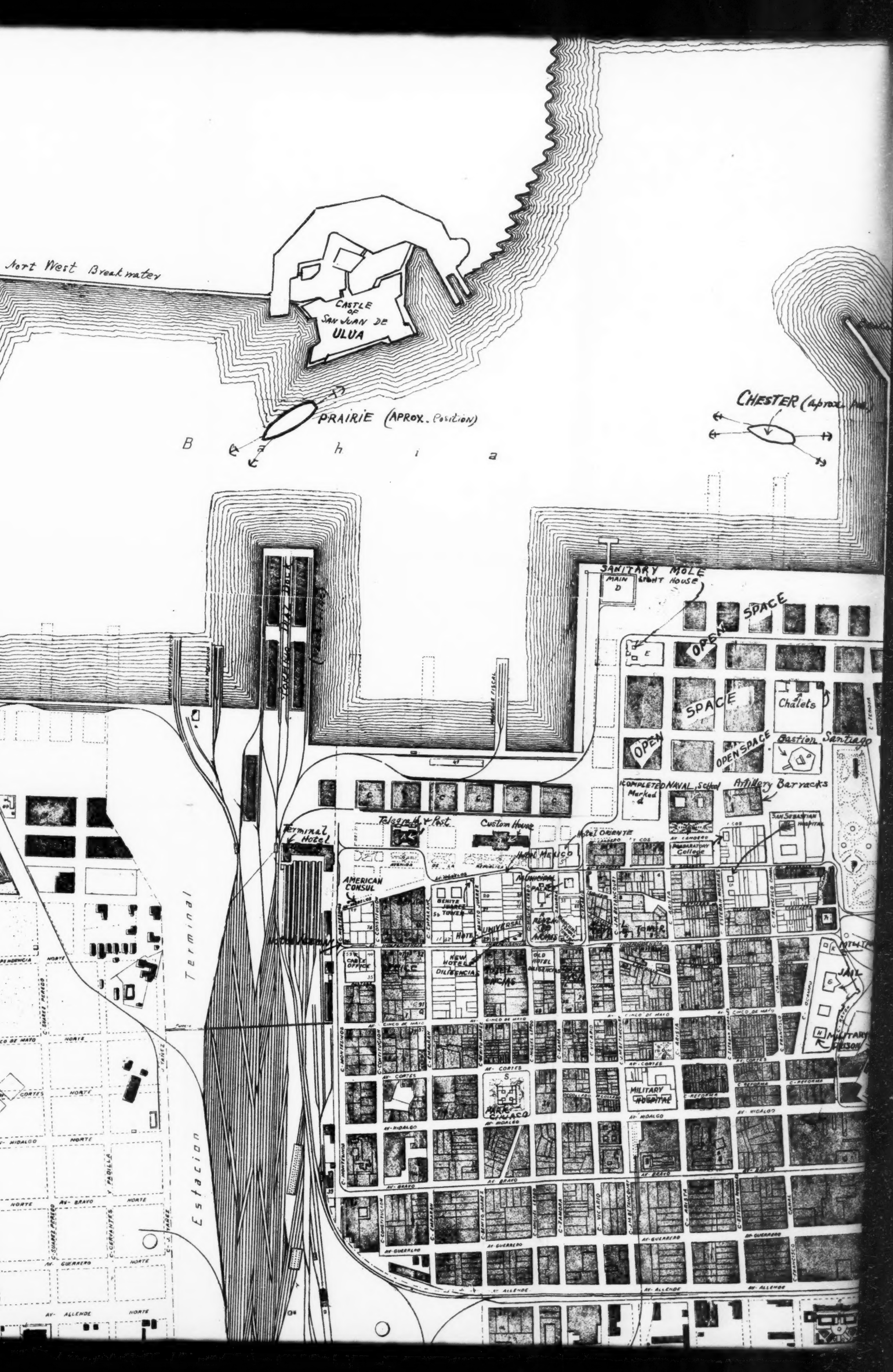

Gallega Reef
North East Breakwater
t West Breakwater
CASTLE OF SAN JUAN DE ULUA
PRAIRIE (APROX. Position)
B a h i a
CHESTER (aprox.
SANITARY MOLE
MAIN D
LIGHT HOUSE
SPACE


U.S.S. UTAH
(aprox. pos)
USS FLORIDA
(aprox. pos)
North East Breakwater
Southeast
Breakwater
Breakwater No. 3
CHESTER (aprox. pos.)
Ante Puerto
SANITARY MOLE


Slaughter
House
AV. HERNANDEZ Y HERNANDEZ

PLANO TOPOGRAFICO
DE LA CIUDAD DE
VERACRUZ.

Formado por Luis P. Guzmán, con los últimos datos
de la Oficina del Ing. de ciudad.


North West Breakwater
CASTLE OF SAN JUAN DE ULUA
PRAIRIE (APROX. Position)
B a h i a
CHESTER (aprox. Pos.)
SANITARY MOLE
MAIN LIGHT HOUSE
OPEN SPACE
OPEN SPACE
OPEN SPACE
Chalets
Bastion Santiago
Completed
Marked
NAVAL School
Artillery Barracks
SAN SEBASTIAN HOSPITAL
Telegraph & Post
Custom House
Terminal & Hotel
Hotel Mexico
Hotel Oriente
Preparatory College
AMERICAN CONSUL
BENITO JUAREZ TOWER
UNIVERSAL HOTEL
ALIANCIA
PLAZA DE ARMAS
L. TAMER
CABLE OFFICE
NEW HOTEL DILIGENCIA
HOTEL ESPAÑAS
OLD HOTEL AUSTRIA
JAIL
MILITARY PRISON
MILITARY HOSPITAL
MARK CUAUCO
Terminal
Estacion
Av. Cortes
Av. Hidalgo
Av. Bravo
Av. Guerrero
Av. Allende
C. Arista
C. Reforma
C. Cinco de Mayo
C. Constitucion
C. Vicario
C. Zaragoza
C. Cervantes
C. Suarez Pereyo
C. Padilla
Norte

Southeast
Breakwater

Obstruction No. 3.

CHESTER (aprox. hull)

Ante Puerto

SANITARY MOLE
MAIN LIGHT HOUSE
D

OPEN SPACE
E
OPEN SPACE
Chalets
OPEN
OPEN SPACE
Bastion Santiago
COMPLETED NAVAL School
Marked d
Artillery Barracks
SAN SEBASTIAN HOSPITAL
Hotel ORIENTE
Preparatory College
Tower
MILITARY COMMANDANT'S QUARTERS
JAIL
G
MILITARY PRISON
H
MILITARY HOSPITAL
AV. HIDALGO
AV. BRAVO
AV. GUERRERO
AV. ALLENDE
AV. JIMENEZ
AV. CORTES
AV. PRIM
AV. CANELO
AV. VALENTIN GOMEZ FARIAS
AV. LEANDRO ALCOCER
AV. MANUEL GONZALEZ
AV. XICOTENCATL
AV. HERNANDEZ Y HERNANDEZ
AV. LIBERTAD
AV. REFORMA
AV. FERROCARRIL
AV. NETZAHUALCOYOTL
C. ARISTA
C. ZARAGOZA
C. PROGRESO
C. TENOYA
C. MARIANO ARISTA
C. DIAZ ARAGON
C. ESCOBEDO
C. FARIAS
C. CEMENTERIO
C. SAN SEBASTIAN
C. SAN JUAN DE LETRAN
C. DE LA TARJEA
C. ITURBIDE
C. SAHAGUN
C. DE LOS PINOS Y TABACOS
C. DE LOS PINOS Y TABACOS
C. DE LOS PINOS Y TABACOS

Edificios Federales

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Sanidad	D
Faros	E
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Jefatura de Hacienda	N
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Mercado antiguo	c
Id Nuevo	d
Carcel	e
Id de Mujeres	f
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Teatro Dehesa	h
Escuela Cantonal Francisco J. Clavijero	i
Id de Varones nº 1 Jose Mª Morales	j
Id id nº 2 Ignacio Allende	k
Id id . 3 Vicente Guerrero	l
Id id . 4 Miguel Macias	m
Id Nocturna Nicolás Bravo	n
Id de Niñas nº 1 Josefa Ortiz de Dominguez	o
Id id . 2 Leona Vicario	p
Id id . 3 Manuela Herrera	q
Id id . 4 Maria R. de Lazaro	r
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Id Mixta Esteban Morales	t
Colegio Preparatorio de Señoritas	u

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Id 5 M A Gomez y E J Unda	5
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Id Particular L R Alcalde	y

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Universal J Martinez y Cº	3
Mexico Ramon Goas	4
Oriente Jose Armengod y Cº	5
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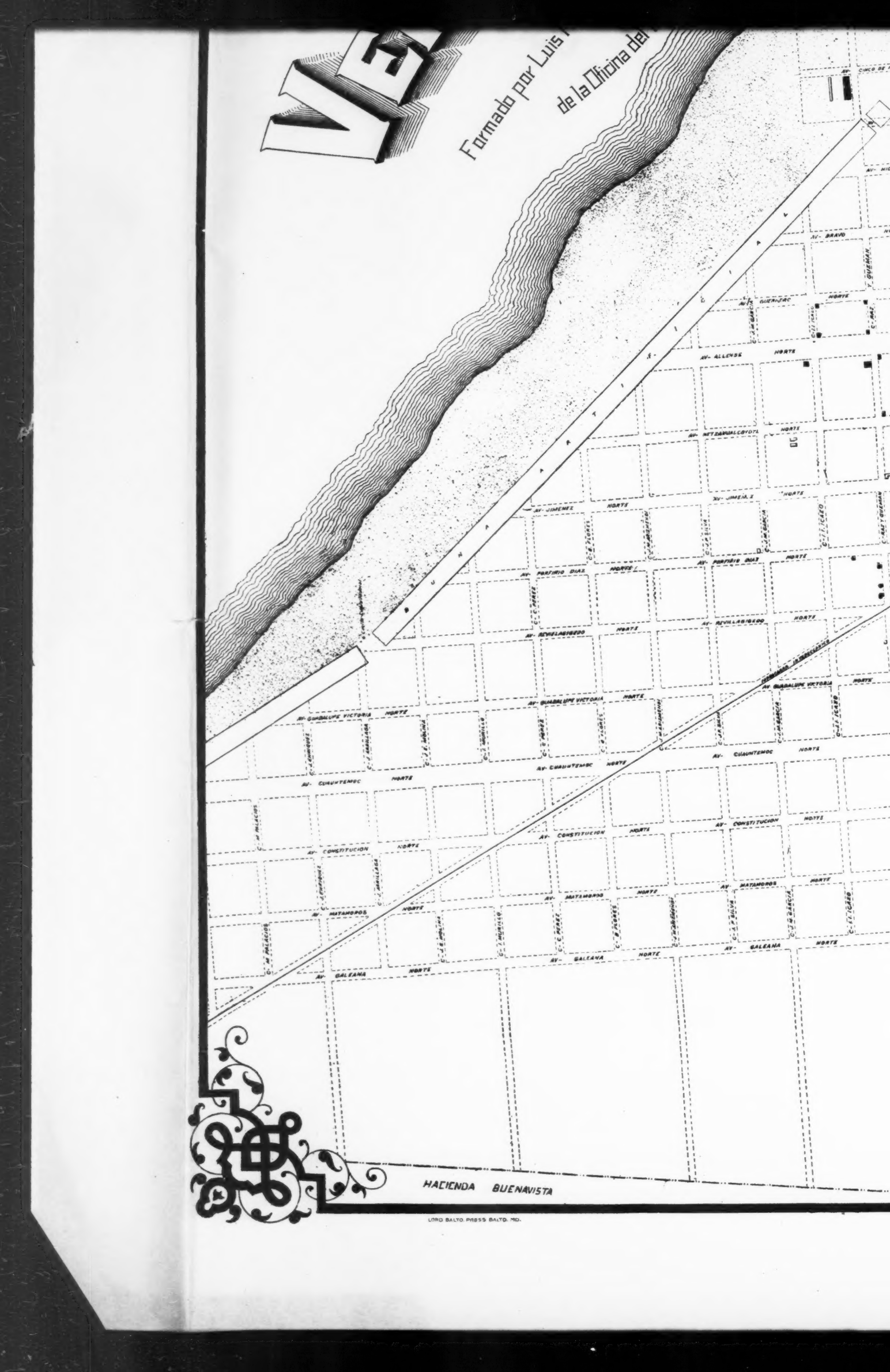

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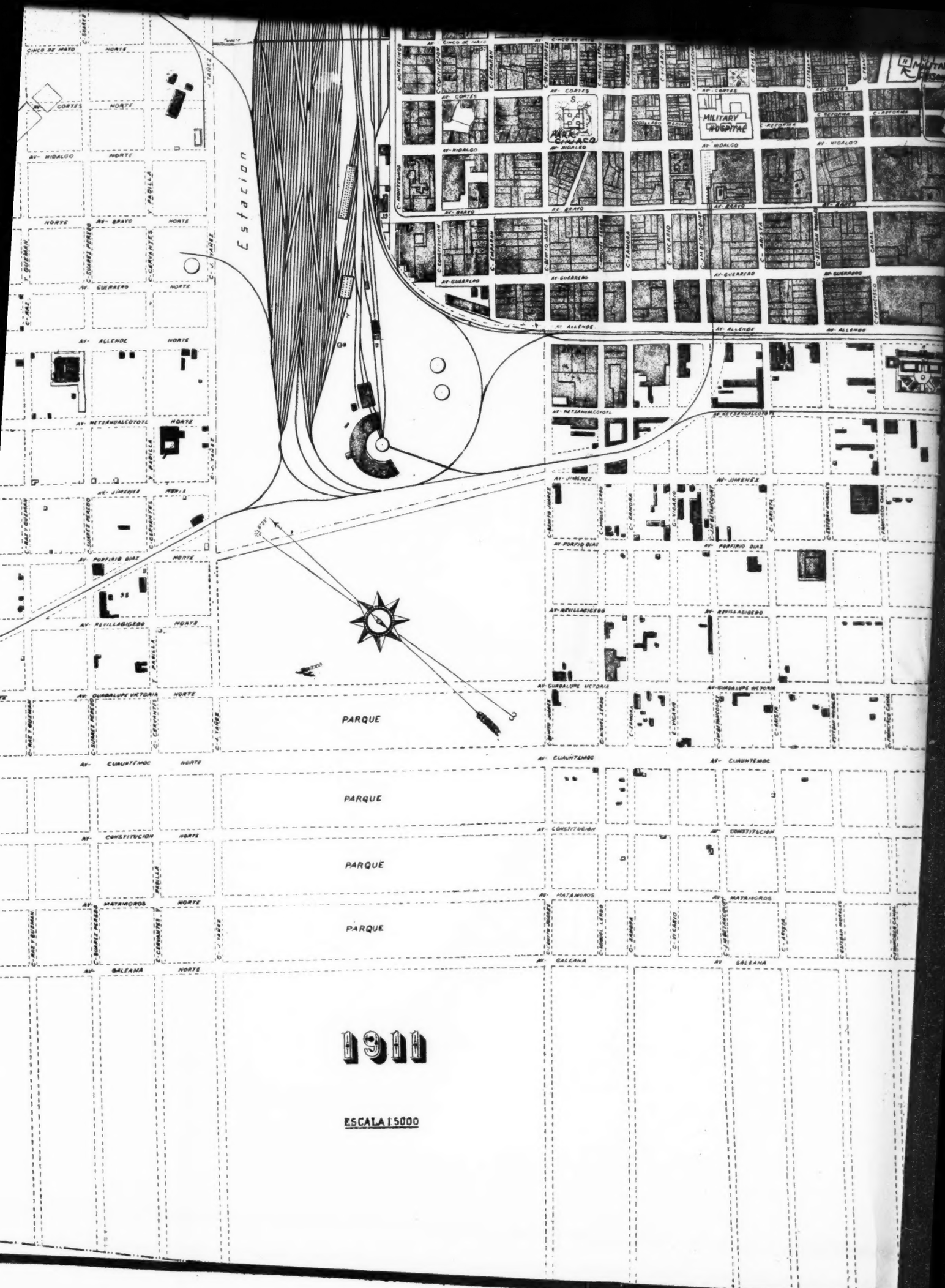
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AV. ALLENDE
AV. NEZAHUALCOYOTL
AV. JIMENEZ
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AV. REVILLAGIGEDO
AV. GUADALUPE VICTORIA
AV. CUAUHTEMOC
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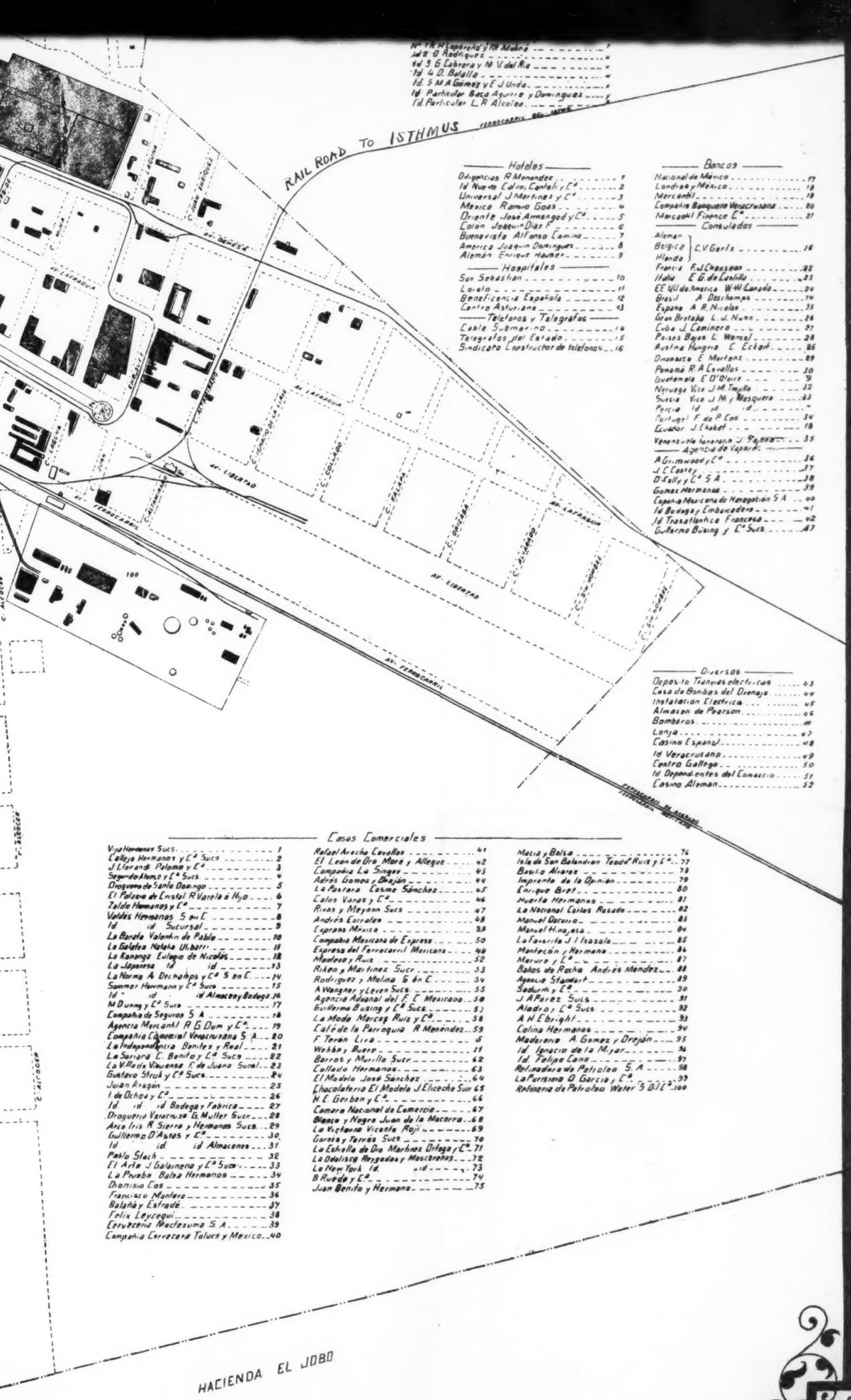
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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

GENERAL SOLUTIONS OF THE PROBLEMS OF "THE REDUCTION TO THE PRIME VERTICAL AND TO THE MERIDIAN," WITH A NEW GRAPHIC METHOD FOR THE SOLUTION OF VARIOUS PROBLEMS IN NAVIGATION

By Captain Armistead Rust, U. S. Navy

The Reduction to the Prime Vertical

1. This method for finding the longitude from an observation near the prime vertical was first proposed by Naval Instructor H. B. Goodwin, Royal Navy, and published in the U. S. Naval Institute Proceedings (see No. 116, of December, 1905, and No. 120, of December, 1906), and subsequently the full tables appeared in Mr. Goodwin's "Position-Line Star Tables," which are furnished to the ships of the United States Navy, and to which the reader is referred for a full explanation of this method.

2. Briefly stated, the tables prepared by Mr. Goodwin are based on the fact that near the prime vertical or position of maximum azimuth the rate of change of altitude is constant, in the first case being $15 \cos L$ per minute, and in the second case $15 \cos d$ per minute; and the solutions are confined to bodies whose azimuths or position angles are nearly 90 degrees.

3. Four problems are involved:

Problem I: Given the altitude or zenith distance of a celestial body, and its hour angle and altitude on the prime vertical, to find its hour angle at the time of observation.

Problem II: Given the hour angle of a celestial body, and its hour angle and altitude on the prime vertical, to find its altitude or zenith distance at the time of observation.

Problem III: Given the altitude or zenith distance of a celestial body, and its hour angle and altitude at maximum azimuth, to find its hour angle at the time of observation.

Problem IV: Given the hour angle of a celestial body, and its hour angle and altitude at maximum azimuth, to find its altitude or zenith distance at the time of observation.

The latitude by dead reckoning or an assumed latitude being given:

(a) In order to solve Problems I and II the following must be known:

t_0, the hour angle on the prime vertical,
h_0, the altitude on the prime vertical, or
z_0, the zenith distance on the prime vertical,
Z, the true azimuth of the body at the time of observation,
$Z_1=\frac{1}{2}(90^\circ+Z)$, the mean azimuth of the body.

(b) In Problem I it is necessary to have also:

h, the true altitude, or z, the true zenith distance, and
T, the time in seconds to change the altitude or zenith distance one minute.

(c) In Problem II it is necessary to have:

t, the hour angle of the body, and
R, the rate of change of altitude or zenith distance per minute.

(d) In order to solve Problems III and IV the following must be known:

t_m, the hour angle at maximum azimuth,
h_m, the altitude or z_m, the zenith distance at maximum azimuth,
M, the position angle of the body, and
$M_1=\frac{1}{2}(90^\circ+M)$, the mean position angle.

(e) In Problem III it is necessary to have also, as in Problem I:

h, the true altitude, or z, the true zenith distance and
T, the time in seconds to change altitude or zenith distance one minute.

(f) In Problem IV it is necessary to have, as in Problem II:

t, the hour angle of the body,
R, the rate of change of altitude or zenith distance per minute.

4. It will not be necessary, for the solution of this problem, to confine ourselves to the immediate vicinity of the prime vertical

or position of maximum azimuth if means be found for obtaining the quantities T and R, referred to above, for azimuths and position angles from 70° to 90°; and thus the utility of Mr. Goodwin's Tables of altitudes and hour angles on the prime vertical may be greatly extended.

5. To find the hour angle on the prime vertical, we have:

$$\cos t_0 = \cot L \tan d. \tag{1}$$

To find the altitude on the prime vertical, we have:

$$\cos h_0 = \sin t_0 \cos d. \tag{2}$$

To find the hour angle at maximum azimuth, we have:

$$\cos t_m = \tan L \cot d. \tag{3}$$

To find the altitude at maximum azimuth, we have:

$$\cos h_m = \sin t_m \cos L. \tag{4}$$

6. From formula 285 of Chauvenet's Spherical Trigonometry (Tenth Edition) we may deduce the following equation:

$$\Delta t = -4 \sec L \operatorname{cosec} Z, \tag{5}$$

in which Δt = time in seconds to change the altitude or zenith distance one minute. Let $\Delta t = T$.

From the same formula we may find Δh = the rate of change of altitude in one minute:

$$\Delta h = -15 \cos L \sin Z. \tag{6}$$

Let $\Delta h = R$ = rate of change of altitude per minute in minutes of arc.

7. From formulas (1), (2), (3), (4), (5), and (6) we can find the quantities t_0, h_0, t_m, h_m, T and R, and therefore we have a general solution of the problem within the limits of 20 degrees of azimuth on either side of the prime vertical. In using (5) and (6) the mean value of Z must be used in the computation, that is, the mean of the actual azimuth of the body at the time of observation and 90 degrees.

In the case of maximum azimuth we have:

$$T = -4 \sec d \operatorname{cosec} M, \tag{7}$$

and

$$R = -15 \cos d \sin M. \tag{8}$$

The time in seconds to change the altitude one minute, T, may be found from Captain Lecky's "D" Table (see "Wrinkles") by entering with the latitude and mean azimuth as arguments and multiplying the number thus found by 4.

8. It will be observed that for the general solution of this problem the azimuth must be known in Problems I and II, and the position angle in Problems III and IV. When the hour angle is given, as in Problems II and IV, the azimuth may be found from the Azimuth Tables, and by interchanging the latitude and declination the position angle may also be found from the Azimuth Tables. When the altitude is given without the hour angle, as in Problems I and III, the azimuth cannot be obtained from the tables. This is most unfortunate, for had these tables a column of altitudes corresponding to the given azimuths the utility of the tables would be greatly extended, not only by making them Altitude-Azimuth Tables as well as Time-Azimuth Tables, but this additional column would make these tables available for finding great circle distances as well as courses, and in fact by changing the names of the arguments we would have direct reading tables for a general solution of the Astronomical Triangle. However, when the altitude only is given, the azimuth may be found from Captain Weir's Azimuth Diagram or from a similar diagram by Mr. G. W. Littlehales of the United States Hydrographic Office, which is issued to the navigator's outfits of our ships. The azimuth in this case may also be found, by interpolation, from Hydrographic Office Publication No. 127—Star Identification Tables.[1]

The Time-Altitude Tables by the late A. C. Johnson, R. N., may be conveniently used for computing the azimuth from the altitude. (See page 42 of the tables.) The formula for the rule there given may be deduced as follows:

$$\begin{aligned}\sin d &= \sin L \sin h + \cos L \cos h \cos Z \\ &= \sin L \sin h + \cos L \cos h (1 - \operatorname{vers} Z) \\ &= \sin L \sin h + \cos L \cos h - \cos L \cos h \operatorname{vers} Z \\ &= \cos(L-h) - \cos L \cos h \operatorname{vers} Z, \end{aligned} \tag{9}$$

or

$$\operatorname{vers} Z = \frac{\cos(L-h) - \sin d}{\cos L \cos h},$$

$$\operatorname{vers} Z = \sec L \sec h \{\cos(L-h) - \sin d\}. \tag{10}$$

[1] In "Azimuth Tables for the Higher Declinations" for declinations 24° to 30°, by Naval Instructor H. B. Goodwin, Royal Navy, the azimuths are given for each degree of altitude from 10° to 55°.

9. There is a simple way to obtain the azimuth, when the altitude is observed, by taking two observations for altitude very carefully and dividing the difference of the altitudes by the interval in minutes and tenths between them, thus obtaining the rate of change of altitude per minute, and with this the azimuth may be found from the Altitude-Azimuth Diagram shown on Plate I, which is a graphic presentation of formula (6). This azimuth corresponds to the middle time between the observations. It must be noted that the quantity R, formula (6), used in the solution of the problem, is not the rate of change of altitude at the time of observation but that due to the *mean* azimuth of the body; and it may be found from Plate I by entering with the mean azimuth, though, as this plate is not drawn to a large enough scale for extreme accuracy, it will be better to compute R, which may be done by dividing 60 by the time in seconds to change the altitude one minute, T, found as shown in par. 7. The quantity, T, also corresponds to the *mean* azimuth. The azimuth found from Plate I is reckoned from the depressed pole except when the declination is greater than the latitude, when it is reckoned from the elevated pole.

10. *Problem I.*—Latitude 30° N., declination 10° N., star bearing to the S.'d and W.'d, true altitude 59° 16′ 30″; a second observation showed that the change of altitude per minute was 10.57′, and from Plate I the azimuth is found to be S. 54° 35′ W., or N. 125° 25′ W. from the elevated pole. Find the hour angle of the star. (See par. 3 (a) and par. 5 (1) and (2).)

Hour angle on P. V. $\cos t_0 = \cot L \tan d$. (1)

Altitude on the P. V. $\cos h_0 = \sin t_0 \cos d$. (2)

Mean azimuth = S. 72° 18′ W., and from Lecky's "D" Table we find T, the time to change the altitude or zenith distance one minute, = 4.848 seconds.

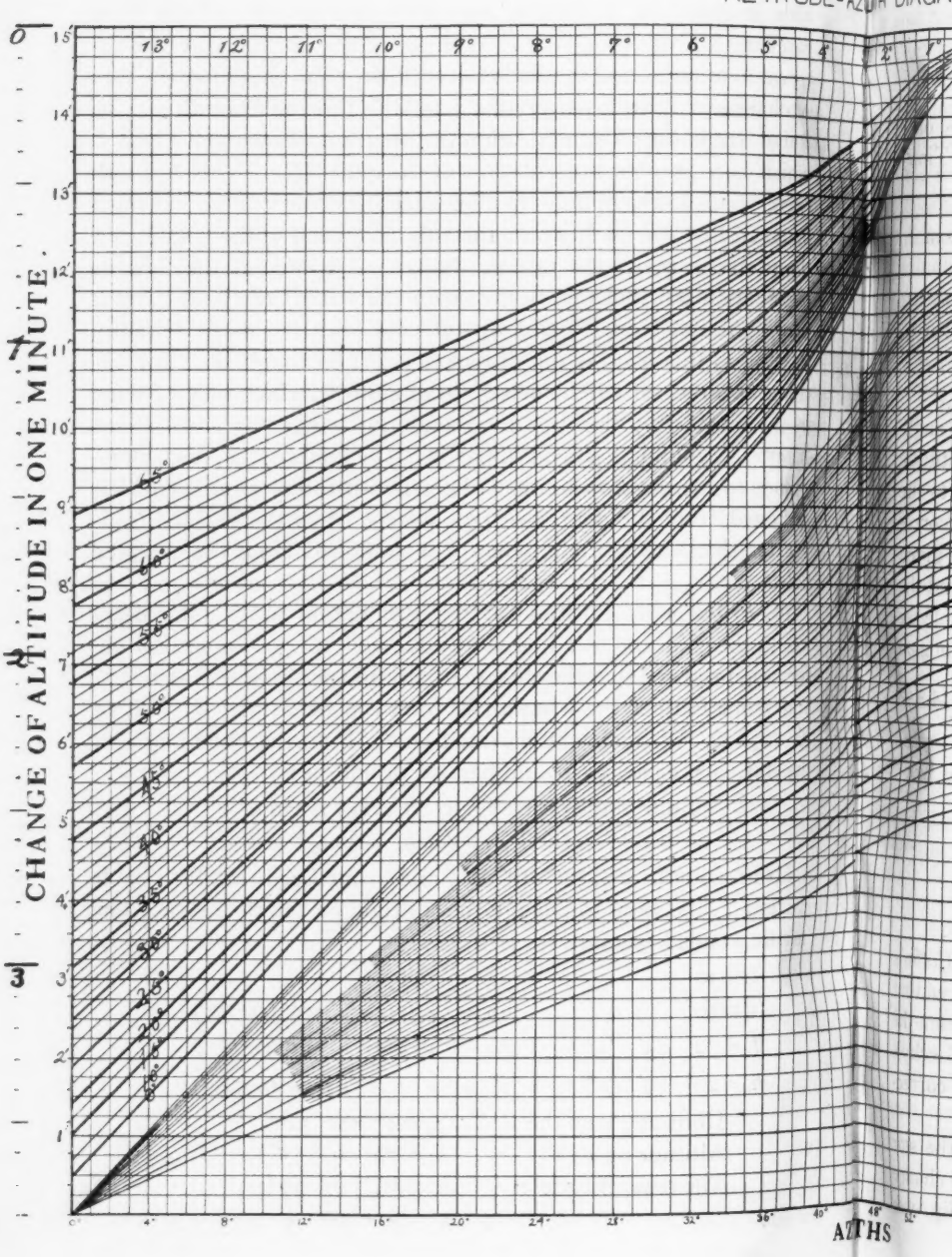
$L = 30°$	cot	10.23856	
$d = 10°$	tan	9.24632	cos 9.99335
$t_0 = 72°\ 13'\ 3''$	cos	9.48488	sin 9.97874
$h_0 = 20°\ 19'\ 15''$			cos 9.97209

Hour angle on the P. V. $t_0 = 4^h\ 48^m\ 52^s$

Altitude on P. V. $h_0 = 20°\ 19'\ 15''$

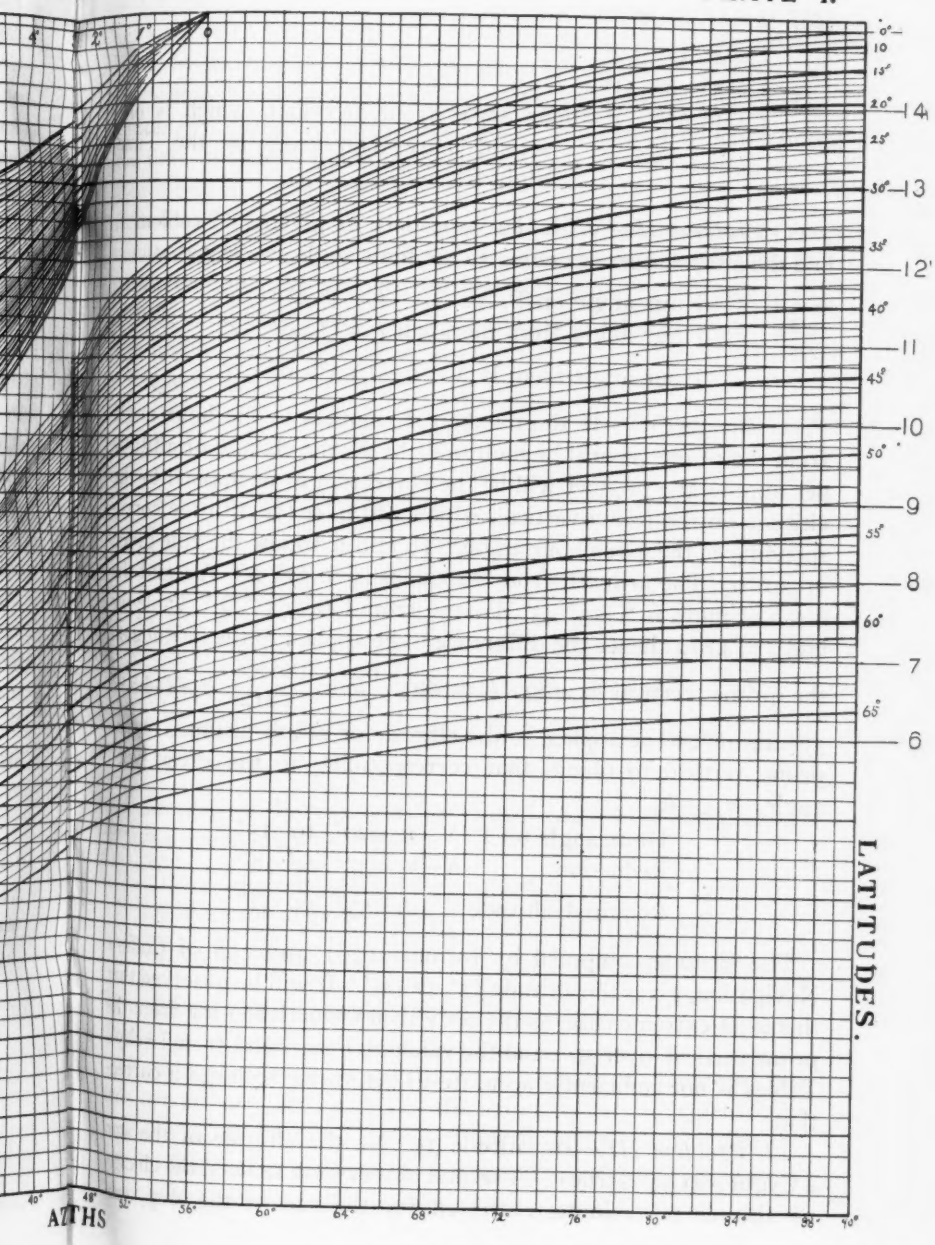
The true altitude $h = 59°\ 16'\ 30''$

$h - h_0 = 38°\ 57'\ 15'' = 2337.25'$.


ALTITUDE-AZIMUTH DIAGR
CHANGE OF ALTITUDE IN ONE MINUTE.
AZIMUTHS

TUDE-AZIM DIAGRAM

PLATE I.



Hence the time to change the altitude 2337.25 minutes $=4.848\times 2337.25=11331$ seconds $=3^h\ 8^m\ 51^s$.

$$\begin{aligned} t_0 &= 4^h\ 48^m\ 52^s \\ t_0 - t &= 3^h\ 8^m\ 51^s \\ t &= 1^h\ 40^m\ 1^s \end{aligned}$$

t = hour angle from meridian, which is one second more than given by the Time Sight Formula.

11. *Problem II.*—With the same data as given in Problem I, find the altitude corresponding to the hour angle $1^h\ 48^m\ 52^s$.

Hour angle on P. V.	$t_0 = 4^h\ 48^m\ 52^s$
Hour angle from meridian	$t = 1^h\ 48^m\ 52^s$
Hour angle from P. V.	$t_0 - t = 3^h\ 0^m\ 0^s$

(See par. 3 (c).) If the number of minutes in the hour angle from the prime vertical be multiplied by R, the change of altitude per minute, the product will be the correction to be applied to the altitude on the prime vertical, which will give the altitude corresponding to the given hour angle. To find R follow the rule given in par. 9. The azimuth from the tables is S. 57° 26′ W., and the mean azimuth is S. 73° 43′ W., and from Lecky's "D" Table we find $T=4.812$; hence the difference to be applied to the altitude on the prime vertical is $180\times R=180\times\frac{60}{T}=\frac{180\times 60}{4.812}=2244.3'=$ 37° 24′ 18″, to be applied to the altitude or zenith distance on the prime vertical to obtain that corresponding to the given hour angle, or $h-h_0$.

Hour angle on P. V.	$h_0 = 20°\ 19'\ 15''$
Reduction	$h - h_0 = 37°\ 24'\ 18''$
Required altitude	$h = 57°\ 43'\ 33''$

The altitude computed by formula (76), page 98 of Coffin's Navigation, gives the altitude 57° 42′ 00″. It will be observed that this is an extreme case, as the body is in azimuth too far from the prime vertical, over 30°, and the value of T as found from Lecky's Tables is not sufficiently accurate to determine so large a correction.

12. *Problem III.*—In latitude 35° N., the altitude of the star α Cygni was 44° (true). A second observation showed the change of altitude per minute, corrected for the run of the ship, was

10.45′. Star bearing to the N.'d and W.'d. Find the hour angle of the star.

From Plate I the horizontal line through 10.45′ on the margin gives, by its intersection with the latitude curve, 35°, the azimuth of the star, N. 58° 25′ W., and its intersection with the declination curve, 45°, gives the position angle 80° 40′, both of which are for the time of observation. The mean value of the position angle then is 85° 20′.

To find T, the time to change the altitude or zenith distance one minute, enter Lecky's "D" Table with the mean value of the position angle as an azimuth and the declination of the star in the latitude column and multiply the number thus found by 4. Thus T is found to be 5.6776 seconds.

We have (par. 5)

$$\cos t_m = \tan L \cot d, \qquad (3)$$

$$\cos h_m = \cos L \sin t_m. \qquad (4)$$

$L=35°$	tan 9.84523	cos 9.91336
$d=45°$	cot 10.00000	
$t_m=45°\ 33'\ 24''$	cos 9.84523	sin 9.85366
$t_m=3^h\ 2^m\ 13.6^s$		
$h_m=54°\ 12'\ 35''$		cos 9.76702

$h=44°\ 00'\ 00''$ = True altitude (observed)

$h_m-h=10°\ 12'\ 35''=612.6$ minutes of arc = Difference of altitudes.

Difference of hour angles $= t-t_m = T(h_m-h) = 5.6776\times 612.6$ $=3478.2$ second $=0^h\ 57^m\ 58.2^s$.

Hour angle at maximum azimuth	$t_m=3^h\ 02^m\ 13.6^s$
Difference of hour angles	$t-t_m=0^h\ 57^m\ 58.2^s$
Required hour angle	$t=4^h\ 0^m\ 11.8^s$

This differs only .7 second from that computed by Johnson's Tables.

The following rule for correcting the observed change of altitude per minute for the run of the ship may be convenient when necessary to use formula (6) or Plate I for finding the azimuth. Use the observed rate of change per minute for finding the approximate azimuth to be applied to the course.

Unless the ship be steering a course at right angles to the direction of the body, the change in altitude in one minute must be corrected for the run of the ship; that is, if D minutes is the speed of the ship per hour, then D seconds is the speed per minute and the correction $= D''$ cos (course − azimuth). Enter the traverse tables with D seconds as a distance and $(C-Z)$ as a course, then the correction is found in the latitude column, to be subtracted from the observed change of altitude per minute when the ship is moving towards the body, and to be added when moving away from the body; in other words, when $(C-Z)$ is less than 90°, subtract; when $(C-Z)$ is greater than 90°, enter with the supplement of $(C-Z)$ and add the correction. The above rules apply when the body is rising; when falling, add when approaching, and subtract when separating.

When the gyroscopic compass is perfected it may provide the means, under favorable conditions on board large ships, for determining the true azimuth as accurately as the altitude is now determined with the sextant.

13. *Problem IV.*—In latitude 35° N., the hour angle of the star α Cygni was $3^h\ 48^m\ 47^s$, declination 45° N., star bearing to N.'d and W.'d. What was its altitude?

To find the position angle when the hour angle, latitude and declination are known, enter the Azimuth Tables with the declination as a latitude and the latitude in the declination column, where the position angle will be found opposite the given hour angle. Thus we find the position angle to be 82°, mean value, 86°, and find T as shown in par. 12 to be 5.672 seconds.

From Problem III, par. 12, we have:

Altitude at maximum azimuth	$h_m = 54°\ 12'\ 35''$
Hour angle at maximum azimuth	$t_m = 3^h\ 2^m\ 13.6^s$
Given hour angle	$t = 3^h\ 48^m\ 47.0^s$
Difference of hour angles	$t - t_m = 0^h\ 46^m\ 33.4^s$

Difference of altitudes in minutes of arc

$$h_m - h = (t - t_m) \times \frac{60}{T} = \frac{46.56 \times 60}{5.672} = 492.5' = 8°\ 12'\ 30''.$$

Altitude at maximum azimuth	$h_m = 54°\ 12'\ 35''$
Difference of altitude	$h_m - h = 8°\ 12'\ 30''$
The required altitude	$h = 46°\ 0'\ 5''$

The computed altitude in this case is 46°.

A GRAPHIC SOLUTION OF THE PROBLEM

14. This problem may be solved graphically as shown on Plate II. It is evident that the drawings may be made on a sufficiently large scale, without being cumbersome, to give results sufficiently accurate for practical navigation. A small sheet, like Plate II (A), may be used as an index chart by having rectangles ruled upon it and numbered; then the large sheet may be divided and the sections numbered in the same way and then cut up so as to be easily handled. The approximate solutions will first be sought on the index chart, the index numbers noted, and then the exact results obtained from the sections of the large sheet corresponding to these index numbers.

15. On Plate II are shown three diagrams: (A) "Hour Angles and Altitudes on the Prime Vertical," consists of two systems of curves. The first set converging to the upper right-hand corner represents formula (1), par. 5:

$$\cos t_0 = \cot L \tan d, \qquad (1)$$

in which the ordinates are latitudes and the abscissæ are hour angles in time.

The second set shows the relation

$$\cos h_0 = \sin t_0 \cos d, \qquad (2)$$

in which the ordinates are altitudes and the abscissæ are hour angles, as before. The common abscissæ connect the two systems. The declinations are found on the curves.

Problem.—In latitude 50° S., find the hour angle and altitude of the star Fomalhaut, declination 30° S., when on the prime vertical.

The horizontal line through 50° on the left-hand margin intersects the time-latitude curve for 30° declination, one of the curves converging to the right, on an ordinate giving an hour angle $=4^h\ 4^m$. This ordinate intersects the time-altitude curve for 30° declination on a horizontal line which determines the altitude, 40.7°, or zenith distance, 49.3°, which may be read from the right-hand margin.

16. Plate II (B), "Time in Seconds to Change Altitude One Minute," is derived from the formula

$$T = \Delta t = -4 \sec L \operatorname{cosec} Z. \qquad (5)$$

If diagram (B) were made on a large scale for azimuths from 60° to 90°, T could be obtained from it with great accuracy. This however, is not necessary, as Lecky's "D" Table may be used instead, as shown in par. 7.

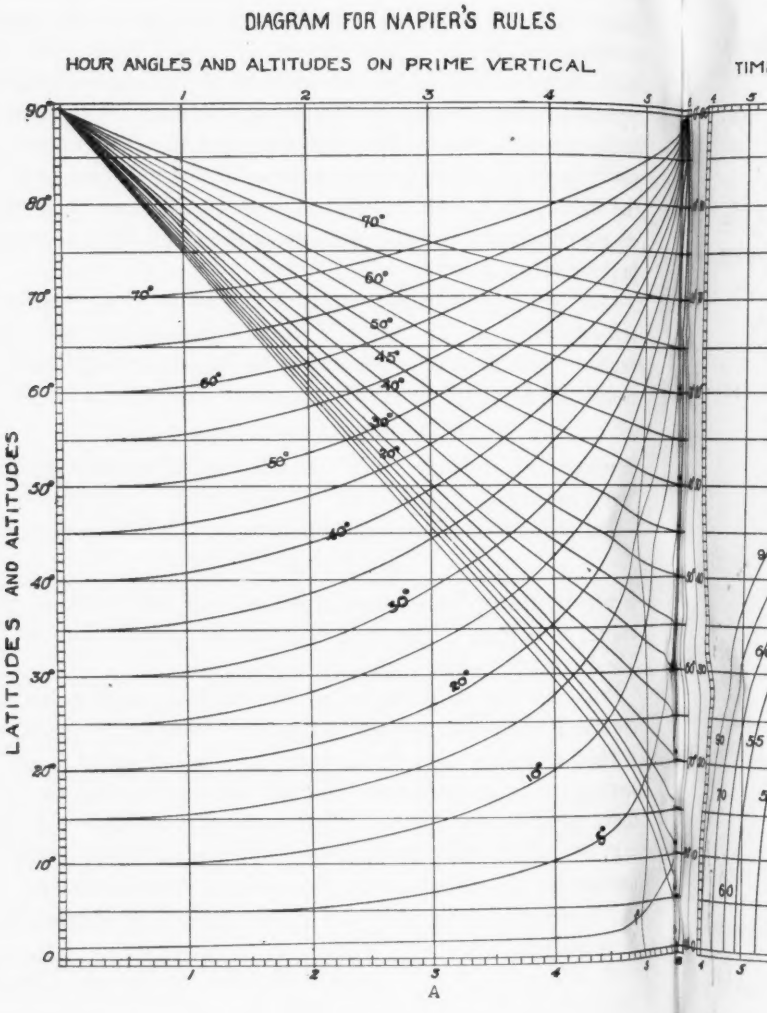


DIAGRAM FOR NAPIER'S RULES
HOUR ANGLES AND ALTITUDES ON PRIME VERTICAL
TIM
LATITUDES AND ALTITUDES
90°
80°
70°
60°
50°
40°
30°
20°
10°
0
1
2
3
4
5
A
70°
60°
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60
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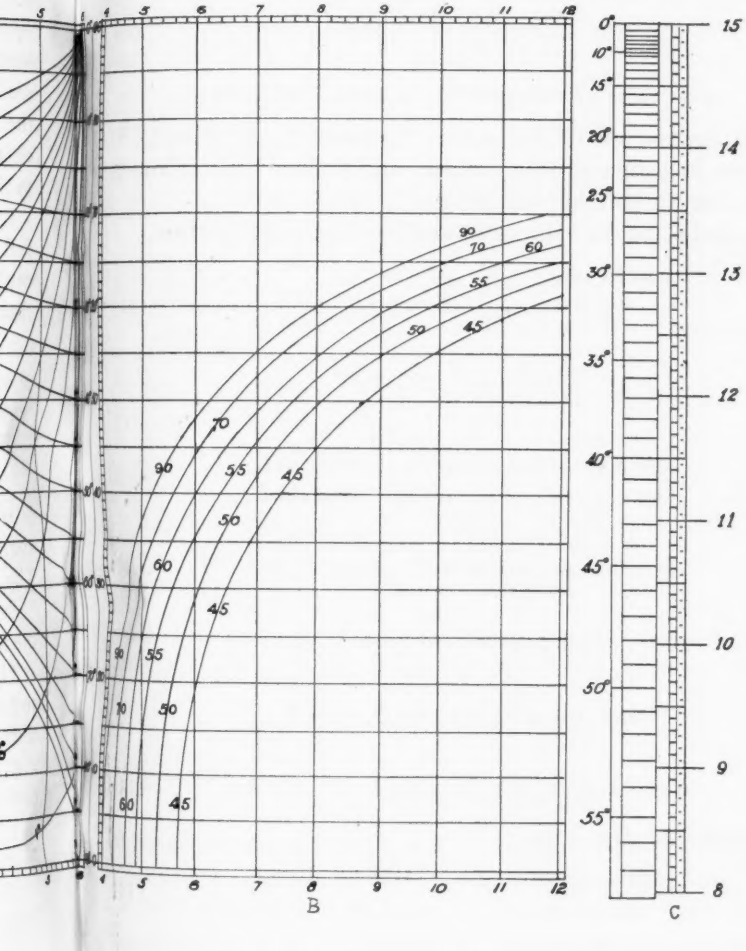
PLATE II.


TIME TO CHANGE ALTITUDE ONE MINUTE
4 5 6 7 8 9 10 11 12
90 70 60 55 50 45
B
0° 10° 15° 20° 25° 30° 35° 40° 45° 50° 55°
15 14 13 12 11 10 9 8
C

17. Plate II (C), shows the rate of change of altitude per minute on the prime vertical, and expresses the relation

$$R=\Delta h=-15\cos L \text{ or } -15\cos d$$

for maximum azimuth. Plate I expresses the general formula for all azimuths (see par. 9):

$$R=\Delta h=-15\cos L\sin Z. \tag{6}$$

SOLUTION BY PROFESSOR H. L. RICE, U. S. NAVY

18. At the request of the writer, Professor H. L. Rice, U. S. Navy, has investigated this problem and deduced the following formulæ for the solution of Problem I, par. 3.

Let t_0 and h_0 be the values of t and h on the prime vertical.

$$\begin{aligned} \Delta h&=h-h_0, & \Delta t&=t-t_0,\\ h_1&=\tfrac{1}{2}(h+h_0), & Z_1&=\tfrac{1}{2}(90^\circ+Z). \end{aligned} \tag{11}$$

Hence,

$$\frac{\Delta h}{2}=h-h_1, \quad Z_0=90^\circ.$$

Then,

$$\begin{aligned} \cos t\ \cos d\cos L&=\sin h\ -\sin d\sin L,\\ \cos t_0\cos d\cos L&=\sin h_0-\sin d\sin L; \end{aligned}$$

hence,

$$(\cos t-\cos t_0)\cos d\cos L=\sin h-\sin h_0. \tag{12}$$

Also,

$$\sin t\cos d=\cos h\sin Z,$$

and

$$\sin t_0\cos d=\cos h_0\sin Z_0=\cos h_0;$$

hence,

$$(\sin t+\sin t_0)\cos d=\cos h\sin Z+\cos h_0. \tag{13}$$

(12) divided by (13) gives:

$$\frac{(\cos t-\cos t_0)\cos L}{\sin t+\sin t_0}=\frac{\sin h-\sin h_0}{\cos h\sin Z+\cos h_0}. \tag{14}$$

Substituting for the sums and differences of sines and cosines the well-known equivalents, we get:

$$-\cos L\tan\tfrac{1}{2}(t-t_0)=\frac{2\cos\tfrac{1}{2}(h+h_0)\sin\tfrac{1}{2}(h-h_0)}{\cos h\sin Z+\cos h_0};$$

hence,

$$\tan\left(\frac{\Delta t}{2}\right)=\frac{-2\sec L\cos h_1\sin\left(\frac{\Delta h}{2}\right)}{\cos h\sin Z+\cos h_0}. \qquad (15)$$

From (11) we have:

$$Z=2Z_1-90^\circ=-(90^\circ-2Z_1);$$

hence,

$$\sin Z=-\cos 2Z_1=1-2\cos^2 Z_1.$$

Substituting this value of Z in (15), we obtain:

$$\tan\left(\frac{\Delta t}{2}\right)=\frac{-2\sec L\cos h_1\sin\left(\frac{\Delta h}{2}\right)}{(\cos h+\cos h_0)-2\cos h\cos^2 Z_1}$$

$$=\frac{-\sec L\cos h_1\sin\left(\frac{\Delta h}{2}\right)}{\cos\tfrac{1}{2}(h+h_0)\cos\tfrac{1}{2}(h-h_0)-\cos h\cos^2 Z_1}$$

$$=\frac{-\sec L\cos h_1\sin\left(\frac{\Delta h}{2}\right)}{\cos h_1\cos\left(\frac{\Delta h}{2}\right)-\cos h\cos^2 Z_1}.$$

Hence,

$$\tan\left(\frac{\Delta t}{2}\right)=\frac{-\sec L\tan\left(\frac{\Delta h}{2}\right)}{1-\cos h\sec h_1\sec\left(\frac{\Delta h}{2}\right)\cos^2 Z_1}. \qquad (16)$$

Now Z is to range from 70° to 90° (or 20° from the prime vertical); hence, Z_1 ranges from 80° to 90°. If we should tabulate

$$m=\cos h\sec h_1\sec\left(\frac{\Delta h}{2}\right)$$

or

$$m=\cos h\sec h_1\sec(h-h_1)$$

for arguments h and h_1, it is easily seen that an error of .005 in m is permissible when an error of 2 seconds in t is allowable; hence, it would be wasted effort to tabulate m to three decimals; and, on the other hand, to give m to two decimals only would perhaps cause an error of something like 3 or 4 seconds. Now we can use the practical method of tabulating to two decimals $n=2m$, and then taking the denominator of (16) in the form

$$D=1-n(\tfrac{1}{2}\cos^2 Z_1);$$

but n will vary in value from about 1 to 5.2, for different values of h and h_1. Hence, to avoid tabulating decimals, we shall take $Q = 100n = 200m$; that is, we tabulate

$$Q = 200 \cos h \sec h_1 \sec(h - h_1), \tag{17}$$

and then (16) becomes

$$\tan\left(\frac{\Delta t}{2}\right) = -\sec L \tan\left(\frac{\Delta h}{2}\right) \cdot \left(\frac{1}{1 - \frac{Q}{200}\cos^2 Z_1}\right). \tag{18}$$

Table I gives the integer Q for all required values of the arguments h and h_1.

Table II gives $\log X = \log \left(\frac{1}{1 - \frac{Q}{200}\cos^2 Z_1}\right)$ for the necessary values of the arguments Q and Z_1 (the mean azimuth). Finally, we have:

$$\tan\left(\frac{\Delta t}{2}\right) = -X \sec L \tan\left(\frac{\Delta h}{2}\right), \tag{19}$$

in which four-place logarithms are quite sufficient, as X is in units of the fourth decimal. Tables I and II are partially shown below. In practice it would probably be found more convenient to use curves rather than the tables, thus doing away with all interpolation.

TABLE I.—VALUES OF Q

h_1	h	10°	34°	40°	46°	52°	58°	64°	70°	76°
10	..	200	..	..	..	..	..	..	..	..
46	..	..	..	..	200	178	156	133	..	..
50	..	..	268	242	217	192	167	141	113	..
54	..	..	300	269	239	210	181	151	121	..
58	..	..	..	..	..	..	200	..	..	96
78	..	..	..	..	..	..	542	..	..	233

h and h_1 vary in value from 10° to 76° and 78°, respectively.

TABLE II.—LOG X IN UNITS OF FOURTH DECIMAL PLACE

Q	Z_1	80°	81°	82°	83°	84°	85°	86°	87°	88°	89°	90°
100	..	66	53	42	32	24	17	11	6	3	1	0
140	..	93	75	59	45	33	23	15	8	4	1	0
180	..	119	97	76	58	43	30	19	11	5	1	0
200	..	132	108	85	65	48	33	21	12	5	1	0
520	..	355	286	224	171	125	87	55	31	14	3	0

The values of the arguments Q and Z_1 include all values required.

19. *Example 1.*—$L=+60°$; $d=+37°\ 45'\ 39''$; $h_0=45°$; $h=55°$; $t_0=63°\ 26'\ 6''$

(a) Trigonometrical solution of astronomical triangle gives:

$t=43°\ 3'\ 25''$ and $Z=70°\ 14'$ (approximate).

(b) Special solution gives:

$h=$	$55°$		
$h_1=$	$50°$	From Table I, $Q=180$	
$Z_1=$	$80.1°$	From Table II, $\log X=(-)0.0117$	
$L=+60°$		sec	0.3010
$\frac{\Delta h}{2}=$	$5°$	tan	8.9420
$\frac{\Delta t}{2}=-10°\ 15'\ 30''$		tan	$(-)9.2547$
$\Delta t=-20°\ 23'\ 0''$			
$t_0=$	$63°\ 26'\ 6''$		
$t=$	$43°\ 3'\ 6''$, error $=19''=1.3$ seconds in time.		

Example 2.—$L=25°$ N.; $d=15°$ N.; $t_0=54°\ 55'\ 36''$; $h_0=37°\ 45'\ 52''$; $h=64°\ 0'$.

(a) Solution by trigonometry gives:

$t=25°\ 36'\ 36''$; $Z=72°\ 16'$ (approximate).

(b) Special solution gives:

$h=$	$64°\ 0'$		
$h_1=$	$50.88°$	From Table I, $Q=143$	
$Z_1=$	$81.13°$	From Table II, $\log X=(-)0.0075$	
$L=$	$25°$ N.	sec	0.0427
$\frac{\Delta h}{2}=$	$13°\ 7'\ 4''$	tan	9.3674
$\frac{\Delta t}{2}=-14°\ 39'\ 30''$		tan	$(-)9.4176$
$\Delta t=-29°\ 19'\ 0''$			
$t_0=$	$54°\ 55'\ 36''$		
$t=$	$25°\ 36'\ 36''$, error $=0$.		

20. Problem II, the converse of Problem I, may be solved by the following formula, deduced by Professor Rice:

$$\tan\left(\frac{\Delta h}{2}\right)=\frac{-\cos L\sin Z\tan\left(\frac{\Delta t}{2}\right)}{1-\sin t_0\operatorname{cosec} t_1\cos^2 Z_1\sec\left(\frac{\Delta t}{2}\right)}. \qquad (20)$$

The notation is the same as before. We could tabulate

$$Q' = 200 \sin t_0 \operatorname{cosec} t_1 \sec\left(\frac{\Delta t}{2}\right)$$
$$= 200 \sin t_0 \operatorname{cosec} t_1 \sec(t_1 - t_0) \qquad (20a)$$

in a double-entry table with the arguments t_0 and t_1, just as before in the case of $Q = 200 \cos h \sec h_1 \sec(h - h_1)$ with the arguments h and h_1. In fact we can enter the "Q" Table and take out Q' if for the argument h we use $90° - t_0$, and for h_1 we use $90° - t_1$. Then, too, the former table giving the log X is directly available, if we enter with Q', in place of Q, and Z_1 as arguments. Finally, we have:

$$\tan\left(\frac{\Delta h}{2}\right) = -X \cos L \sin Z \tan\left(\frac{\Delta t}{2}\right). \qquad (21)$$

21. For the solutions of Problems III and IV, the cases of maximum azimuth, when the declination is greater than the latitude, formulæ (17), (19), (20a) and (21), and also Tables I and II, become available if we substitute in them the hour angles and altitudes at maximum azimuth for t_0 and h_0, the declination for the latitude and the value of the position angle, M, at observation, and its mean value, $M_1 = \frac{1}{2}(90° + M)$, for Z and Z_1. Then from (20a) we have

$$Q'' = 200 \sin t_m \operatorname{cosec} t_1 \sec (t_1 - t_m) \qquad (21a)$$

HOUR ANGLE DIAGRAM (PLATE III)

22. Until the gyroscopic compass is perfected, probably the most accurate way to determine the true azimuth of a body directly by observation on board ship is that described in par. 9, as the motion of the ship due to the sea is practically eliminated.

In Whole No. 124 of the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, page 1492, in an article by the writer, is shown a Star-Finding Diagram which, if properly enlarged, may be used for finding the exact hour angle when the altitude and azimuth are known, or it may be used for finding the altitude corresponding to a given hour angle and azimuth.

This diagram is shown on Plate III, and may be divided into sections for use as an index chart, as described for Plate II (A), par. 14.

The writer has found Plate III very convenient for finding the altitude at which to set the sextant in order to pick up a particular star in the early evening twilight, or to find Venus or Jupiter by day; thus:

From the apparent time of twilight find the star's hour angle, and its azimuth from the tables. Enter Plate III with the hour angle on the margin. The intersection of the horizontal line through this point with the declination curve of the body fixes a vertical line the intersection of which with the horizontal line through the given azimuth determines the altitude curve of the body.

Example.—In the early evening twilight, Lat. 11° 37′ N., Long. 81° 9′ W., what is the altitude of Sirius when its hour angle is $3^h\ 52^m\ 16^s$ (star bearing, S. 65° E.; declination, 16° 30′ S.)?

$3^h\ 52^m\ 16^s = 58°\ 4'$, and from Plate III the altitude is found to be 25° 55′. Set the sextant to this and at the proper time look at the horizon over the pelorus set at S. 65° E. Thus the reflected image of the star may be easily picked up on the horizon long before the eye can catch the direct image in the sky.

To identify a star by its altitude and azimuth with the aid of Plate III:

Enter the Azimuth Tables in the latitude of the ship with the azimuth as an hour angle and the altitude as a declination; the corresponding azimuth is the hour angle of the star. Then:

Enter Plate III with the azimuth on the margin; the intersection of the horizontal line through this point with the curve corresponding to the true altitude fixes a vertical line the intersection of which with the horizontal line corresponding to the hour angle previously found determines the declination of the body.

For convenience in use, and in order to preserve the diagrams, Plates I and III should be mounted on heavy cardboard.

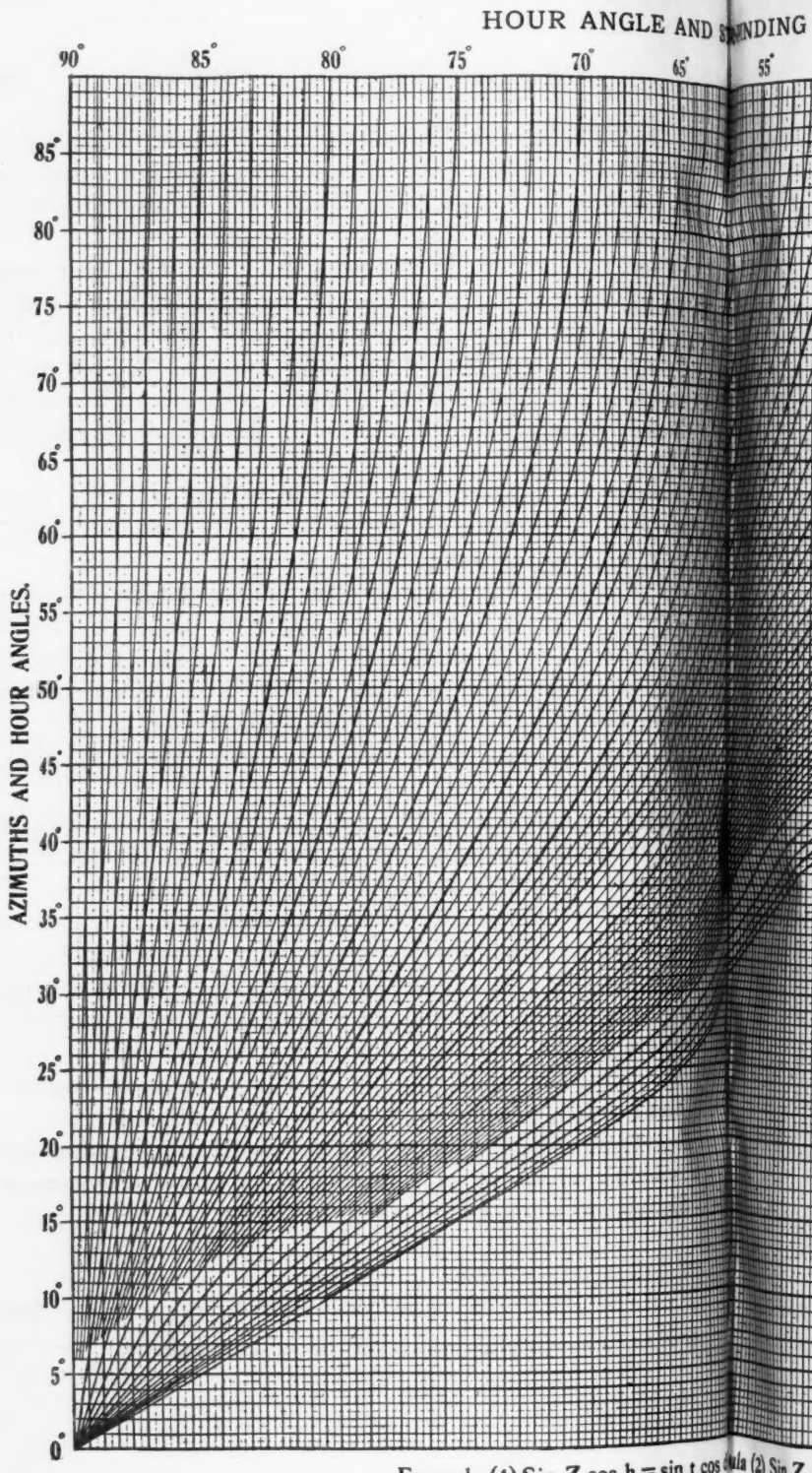
23. There are other uses to which Plate III may be put, as it is a solution of the general formula of spherical trigonometry (Fig. 1),

$$\sin a : \sin b :: \sin A : \sin B,$$

or

$$\sin A \sin b = \sin B \sin a, \qquad (22)$$

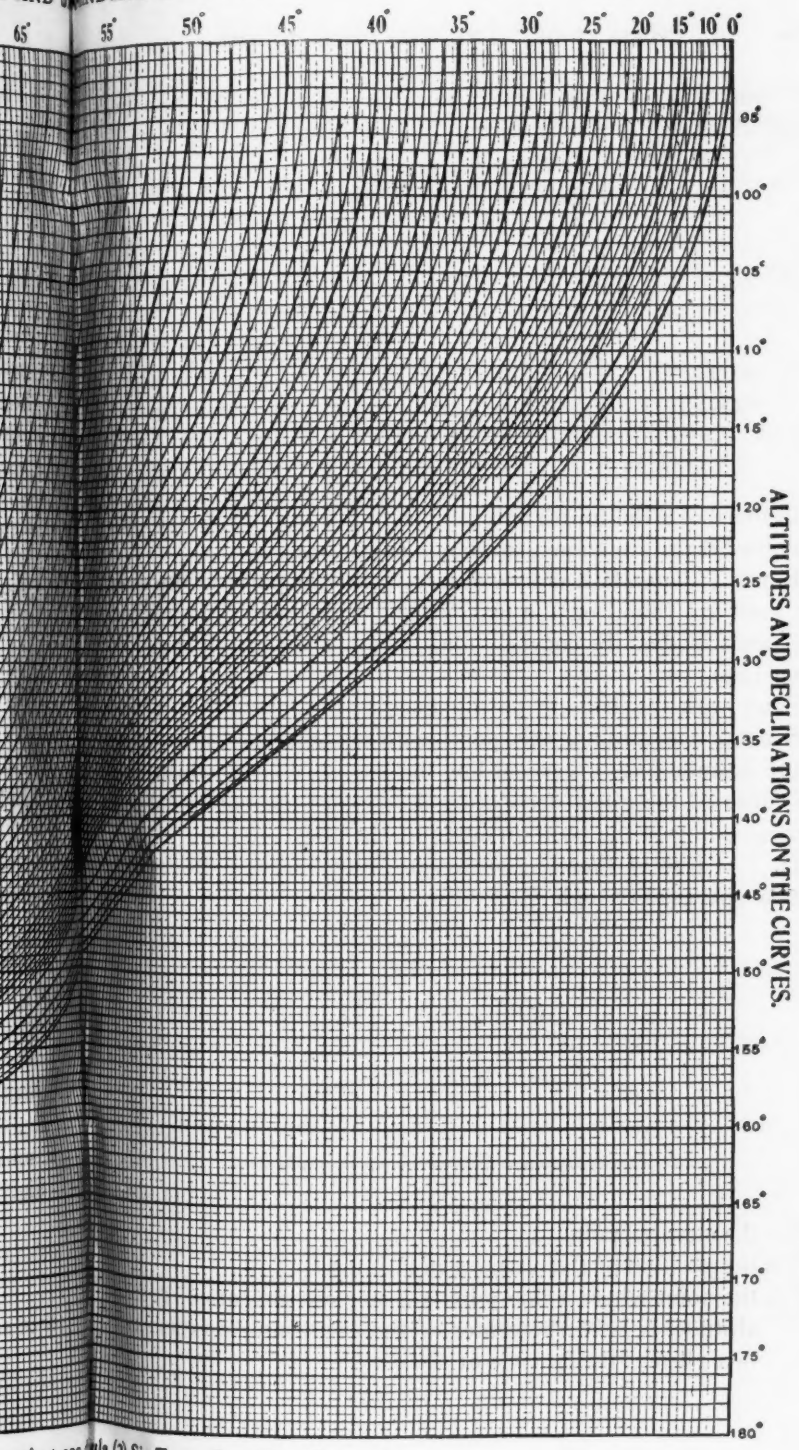
or of any other formula which may be put in this shape.



Formula (1) Sin Z cos h = sin t cos ula (2) Sin Z

E AND S[illegible]NDING DIAGRAM.

PLATE III.



= sin t cos [illegible]a (2) Sin Z cos L = Sin M cos d.

From (22), by substituting the sides and angles of the astronomical triangle, we may derive the following (see Fig. 2):

$$\sin Z \cos h = \sin t \cos d, \tag{23}$$
$$\sin Z \cos L = \sin M \cos d, \tag{24}$$
$$\sin t \cos L = \sin M \cos h. \tag{25}$$

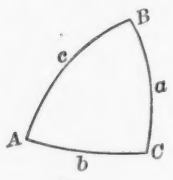


FIG. 1

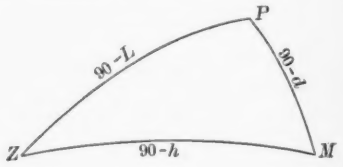


FIG. 2

In the above, the fourth part may be found from Plate III when the other three are known, as shown in par. 22.

In using Plate III it will be observed that the parts whose sines are used are found on the margin, and those whose cosines are used are found on the curves. Thus, to find the position angle, M, from (24):

Enter with the azimuth on the margin; the intersection of the horizontal line through this point with the curve corresponding to the latitude fixes a vertical line the intersection of which with the curve of the given declination determines the horizontal line corresponding to the position angle of the body.

24. *The Use of Plate III in Great-Circle Sailing.*—In the terrestrial spherical triangle PAS (Fig. 3):

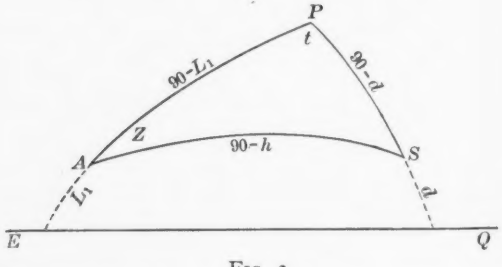


FIG. 3

P is the elevated pole,

A is the position of the observer in latitude L_1,

S is the point where a line joining a star of declination, d, and altitude, h, with the center of the earth intersects its surface; hence, the latitude of $S = d = L_2$.

It is evident from Fig. 3 that the azimuth of the star, in the zenith of S, is the great-circle course from A to S, and that the hour angle of the star is the difference of longitude between the meridians of A and S; hence the well-known rule for finding the great-circle course from the Azimuth Tables:

With the difference of longitude as an hour angle, enter the latitude of departure, and the great-circle course will be found in place of the azimuth in the declination column corresponding to the latitude of destination.

From Fig. 3 it is also seen that the great-circle distance between A and S is the complement of the altitude of the star, and we may find this distance from the "Star Identification Tables," Hydrographic Office Publication No. 127, with a little interpolation, but more conveniently from Plate III.

25. In Fig. 4, let:

C = great-circle course from A to S,
D = great-circle distance,
L_1 = latitude of A,
L_2 = latitude of S,
λ = difference of longitude.

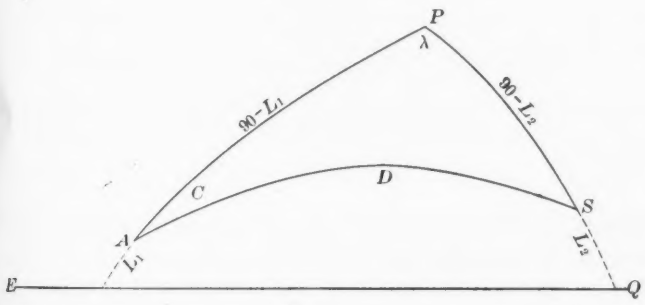


FIG. 4

Then we have:

$$\sin\lambda : \sin D :: \sin C : \sin(90^\circ - L_2),$$

or

$$\sin\lambda : \cos(90^\circ - D) :: \sin C : \cos L_2;$$

hence,

$$\sin\lambda \cos L_2 = \sin C \cos(90^\circ - D). \qquad (26)$$

Example.—Find the great-circle course and distance from Ocracoke Inlet in Lat. 35° N., Long. 76° 0′ W., to the Strait of Gibraltar in Lat. 36° 0′ N., Long. 5° 0′ W.

Here $L_1 = 35°\ 0'$ N., $L_2 = 36°\ 0'$ N., and $\lambda = 70°\ 30'$. Hence we find the initial great-circle course from the Azimuth Tables, $C =$ N. 67° E., and from Plate III, $90° - D = 34°$; hence $D = 56° = 3360$ miles, only 3 miles less than the computed distance, and probably as accurate a result as could be obtained by direct measurement from a great-circle chart, even with the greatest care.

26. *The Use of Plate II (A), in Great-Circle Sailing.*—Plate II (A), gives a general solution to formulæ derived by Napier's Rules. Thus, nearly all of those given on pages 24 to 27 of Coffin's Navigation and Nautical Astronomy may, by a little transposing, be put in the form

$$\cos t_0 = \cot L \tan d, \tag{1}$$

or

$$\cos h_0 = \sin t_0 \cos d. \tag{2}$$

Thus, referring to Fig. 5:

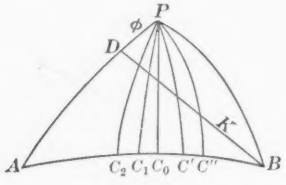


FIG. 5

Problem V.—To project on a chart the arc of a great circle connecting two given points on the earth's surface.

Let $L_1 = (90° - PA)$, and λ_1 be the latitude and longitude of A, the point of departure; and let $L_2 = (90° - PB)$, and λ_2 be the same of B, the point of destination. From P draw a perpendicular to the great-circle track AB, PC_0; then C_0 is nearer the pole P than any other point of AB, and is called the vertex of the great circle, and lies between A and B unless either A or B is greater than 90°. C', C'' and C_1, C_2 are other points of the great-circle track whose positions it is desired to determine.

Let $L_v = (90° - PC_0)$, and λ_v be the latitude and the longitude of C_0. $\lambda = (\lambda_1 - \lambda_2)$ is the difference of longitude between A and

B. $AB=D°$ is the great-circle distance from A to B, A the great-circle course from A to B, and B the same from B towards A. From B draw K perpendicular to PA, dividing it into $PD=\phi$ and $AD=90°-(L_1+\phi)$. ϕ is $-$ when D falls on AP produced.

Then we have:

$$\cos\lambda=\cot(90°-\phi)\tan L_2 \qquad (27)$$

$$\cos(90°-\phi)=\cot\lambda\tan K, \qquad (28)$$

$$\cos(L_1+\phi)=\cot A\tan K. \qquad (29)$$

Formula (26) and Plate III may be used as a check.

To find the course from A:

Determine from the sign of $\cos\lambda$ what quadrant $(90°-\phi)$ will fall in, and find $(90°-\phi)$ by using (27) in connection with Plate II (A). From the algebraic sign of $\cos(90°-\phi)$ note the quadrant K will lie in, and find its value by using (28) with the same plate, and in the same way find the course A from (29). For the above solutions use curves converging to the right.

To find the latitude and longitude of the vertex:

$$\cos L_v=\sin A\cos L_1. \qquad (30)$$

From (30), with the aid of Plate II (A), using the curves converging at the left hand, L_v may be readily found.

We also have:

$$\cos(90°-L_1)=\cot A\tan\{90°-(\lambda_1-\lambda_v)\}. \qquad (31)$$

From (31) and Plate II (A), using the curves converging at the right hand, and noting the quadrants the different angles will fall in from the signs of the functions, we may find $(\lambda_1-\lambda_v)$ and hence λ_v.

To find any number of points C', C'', C''', etc., we may assume the differences of longitude 5° or 10° apart, λ', λ'', λ''', etc., or we may assume the latitudes L', L'', L''', etc., and find the corresponding longitudes. In either case the following formulæ may be used with Plate II (A):

$$\left.\begin{aligned}\cos\lambda' &=\cot L_v\tan L',\\ \cos\lambda'' &=\cot L_v\tan L'',\\ \cos\lambda''' &=\cot L_v\tan L''', \text{ etc.}\end{aligned}\right\} \qquad (32)$$

Through the points thus determined the track may be drawn.

27. *Problem VI.*—To find the great-circle distance and course between two given points.

Let D be the distance between the two points A and B, Fig. 5.

We have, after rearranging the formulæ derived from Napier's Rules to suit (1) and (2):

$$\cos(90^\circ - L_2) = \sin(90^\circ - \phi)\cos K, \tag{33}$$

$$\cos D = \sin(L_1 + \phi)\cos K. \tag{34}$$

Find K and D from Plate II (A) using the curves converging at the left hand.

The initial course, A, is found from

$$\cos(L_1 + \phi) = \cot A \tan K. \tag{29}$$

As a check we have

$$\cos A = \cot(L_1 + \phi)\tan(90^\circ - D^\circ). \tag{35}$$

Finally, we have:

$$\cos B = \sin L_v \cos\{90^\circ - (\lambda_v - \lambda_2)\}, \tag{36}$$

from which the final course to B may be found.

28. To illustrate the ease with which this problem may be solved with the aid of Plate II (A) we will solve the example given on page 28, Coffin's Navigation, and it will be found that, notwithstanding the very small scale of the diagram, comparatively accurate results may be obtained.

Example.—Find the great-circle distance and course from San Francisco to Yokohama, and also the latitude and longitude of the vertex, and the final course. Formulæ (27), (28), (33), (34), (29), (30), (31), (36).

Here we have:

San Francisco: $L_1 = 37^\circ\ 48'$ N.; $\lambda_1 = 122^\circ\ 28'$ W.
Yokohama: $L_2 = 35^\circ\ 26'$ N.; $\lambda_2 = 139^\circ\ 39'$ E.
$\lambda_1 - \lambda_2 = \lambda = 97^\circ\ 53'$.

Follow (1) and (2) as guides in using Plate II (A):

$$\cos\ t_0 = \cot L \tan d, \tag{1}$$

$$\cos h_0 = \sin t_0 \cos d. \tag{2}$$

Note that d is found on the curves, and in using the other formulæ in connection with Plate II (A), the quantities corresponding to d must be sought on the curves. Those substituted for L and h_0 are ordinates, while those used in the place of t_0 are abscissæ. This plate should have scales for degrees and minutes at the top and bottom, as well as those for time.

The curves converging at the upper right-hand corner are used with (1) and will be designated by (R), while those to the left are used with (2) and will be indicated by (L).

To find ϕ (see Fig. 5):

$$\cos\lambda = \cot(90^\circ - \phi)\tan L_2. \qquad (27)$$

$\lambda = 97^\circ\ 53'$. Hence its cosine is $-$ and $\cot(90^\circ - \phi)$ must be $-$, or $90^\circ - \phi$ must be in the second quadrant; hence ϕ must be $-$. $\text{Cot}(90^\circ - \phi) = \cot(180^\circ - (90^\circ - \phi)) = \cot(90^\circ + \phi)$. But $\cos\lambda = \cos(180^\circ - \lambda) = \cos 82^\circ\ 7'$. $82^\circ\ 7' = 5^h\ 28^m\ 28^s$. Enter Plate II (A) with $5^h\ 28^m\ 28^s$ as an abscissa to the (R) curve for L_2 ($35^\circ\ 26'$), the corresponding ordinate is 79°; hence $90^\circ + \phi = 79^\circ$, or $\phi = -11^\circ$; that is, D, the foot of the perpendicular, K, lies on the opposite side of the pole from Yokohama. The computed value is $-10^\circ\ 55'$.

To find the length of the perpendicular from the point of destination to the opposite side, K:

$$\cos(90^\circ - \phi) = \cot\lambda \tan K. \qquad (28)$$

In this case $\cos(90^\circ - \phi)$ is $-$, $\cot\lambda$ is $-$; therefore $\tan K$ is $+$ and K must lie in the first quadrant. But $\cot\lambda = \cot(180^\circ - \lambda) = \cos\ (180^\circ - 97^\circ\ 53') = \cot 82^\circ\ 7'$. $\cos(90^\circ - \phi) = \cos\{180^\circ - (90^\circ - \phi)\} = \cos(90^\circ + \phi) = 79^\circ = 5^h\ 16^m$. Enter Plate II (A) with $5^h\ 16^m$ as an abscissa and $82^\circ\ 7'$ as an ordinate. These intersect on the 54° curve (R); hence $K = 54^\circ$.

We may also find K by

$$\cos(90^\circ - L_2) = \sin(90^\circ - \phi)\cos K. \qquad (33)$$

$90^\circ - L_2 = 54^\circ\ 34'$; $90^\circ - \phi = +101^\circ$. $\text{Sin}(90^\circ - \phi) = \sin(180^\circ - (90^\circ - \phi)) = \sin(90^\circ + \phi) = \sin 79^\circ$. $79^\circ = 5^h\ 16^m$. Enter with $54^\circ\ 34'$ as an ordinate and $5^h\ 16^m$ as an abscissa, using the (L) curves, and we find $K = 54^\circ$ as before.

To find D, the great-circle distance:

$$\cos D = \sin(L_1 + \phi)\cos K. \qquad (34)$$

The signs of all the functions are $+$. $L_1 + \phi = 26^\circ\ 48' = 1^h\ 47^m\ 12^s$. With $1^h\ 47^m\ 12^s$ as an abscissa and the 54° (L) curve, we find the corresponding ordinate $D = 75^\circ\ 0' = 4500$ miles. The computed distance is 4470.75 miles.

To find the initial course:

$$\cos(L_1 + \phi) = \cot A \tan K. \qquad (29)$$

$L_1+\phi=26^\circ\ 48'$; hence $\cos(L_1+\phi)$ is +, and as $\tan K$ is +, $\cot A$ is + and A is in the first quadrant. $26^\circ\ 48'=1^h\ 47^m\ 12^s$; $K=54^\circ$. Enter with $1^h\ 47^m\ 12^s$ as an abscissa for the 54° (R) curve, and the corresponding ordinate is the value of $A=56^\circ\ 45'$; the computed value is $56^\circ\ 52'\ 40''$.

To find L_v, the latitude of the vertex:

$$\cos L_v=\sin A\cos L_1. \tag{30}$$

$A=56^\circ\ 45'=3^h\ 47^m$; $L_1=37^\circ\ 48'$. The abscissa $3^h\ 47^m$ determines with the (L) curve for $37^\circ\ 48'$ the ordinate $L_v=48^\circ\ 33'$. The computed value is $48^\circ\ 33'\ 55''$.

To find λ_v, the longitude of the vertex:

$$\cos(90^\circ-L_1)=\cot A\tan\{90^\circ-(\lambda_1-\lambda_v\} \tag{31}$$

In (31) $\lambda_1-\lambda_v$ is the angle APC_0 (see Fig. 5). $90^\circ-L_1=52^\circ\ 12'=3^h\ 28^m\ 48^s$. $A=56^\circ\ 45'$.

On the (R) curves with ordinate $56^\circ\ 45'$ and abscissa $3^h\ 28^m\ 48^s$, we find the value of $90^\circ-(\lambda_1-\lambda_v)=43^\circ\ 8'$; hence,

$$\begin{aligned}\lambda_1-\lambda_v&=\ 46^\circ\ 52'\\ \lambda_1&=122^\circ\ 28'\ \text{W.}\\ \hline \lambda_v&=169^\circ\ 20'\ \text{W.}\end{aligned}$$

The computed value is $169^\circ\ 15'\ 26''$ W.

To find B, the final course:

$$\cos B=\sin L_v\cos(90^\circ-(\lambda_v-\lambda_2)). \tag{36}$$

In (36), $\lambda_v-\lambda_2$ is the angle C_0PB, Fig. 5. $90^\circ-(\lambda_v-\lambda_2)=38^\circ\ 54'\ 26''$; $L_v=48^\circ\ 33'=3^h\ 14^m\ 12^s$. With $3^h\ 14^m\ 12^s$ as an abscissa and the (L) curve for $38^\circ\ 54'\ 26''$, we find B, the corresponding ordinate, $=54^\circ$, which agrees with the value found from the Azimuth Tables.

29. *Problem VII.*—Find the great-circle course and distance when the point of departure and the destination lie on opposite sides of the equator.

By the application of Napier's Rules to Fig. 6 we obtain the following formulæ:

$$\cos\lambda=\cot(90^\circ-\phi)\tan L_2, \tag{37}$$

$$\cos(90^\circ-\phi)=\cot\lambda\tan K, \tag{38}$$

$$\cos(L_1-\phi)=\cot A\tan K, \tag{39}$$

$$\cos(180^\circ-D)=\sin(L_1-\phi)\cos K. \tag{40}$$

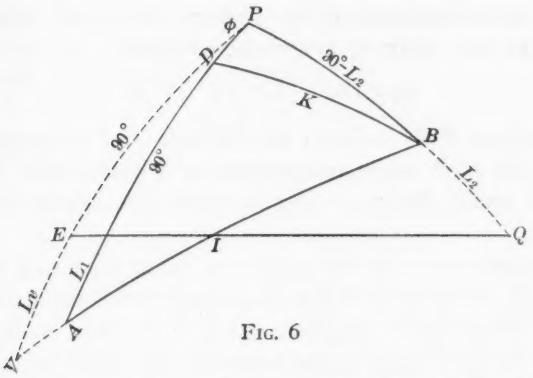


FIG. 6

Example.—Lat. A, $L_1 = 32°\ 0'$ S., Long., $\lambda_1 = 165°\ 45'$ E.

Lat. B, $L_2 = 36°\ 0'$ N., Long., $\lambda_2 = 123°\ 0'$ W.

(1) Find the course and distance from A to B.

(2) Find the latitude of the southern vertex and its longitude.

(3) Find the final course to B.

Here we have $\lambda = 71°\ 15' = 4^h\ 45^m$. From (37) we see cos λ is +; tan L_2 is +; hence cot $(90° - \phi)$ must be +, or $(90° - \phi)$ lies in the first quadrant; hence ϕ must be +.

From Plate II (A) (R) curve for 36°, we have $90° - \phi = +66°\ 45'$, or $\phi = +23°\ 15'$. $90° - \phi = 66°\ 45' = 4^h\ 27^m$; hence, from (38), $K = 50°$.

K may also be found from (33); $90° - L_2 = 54°$ with, and with the same value of $90° - \phi = 66° = 4^h\ 24^m$; we find $K = 50°$ as before.

From (39), $L_1 - \phi = 8°\ 45' = 0^h\ 35^m$; hence $A =$ N. 50° E.

From (40), $180° - D = 84°\ 45'$, or $D = 95°\ 15' = 5715$ miles.

The latitude of the vertices are equal but of opposite names and may be found from (30). $A = 50° = 3^h\ 20^m$. $L_1 = 32°$; hence $L_v = 49°\ 30'$ S.

From (31) we find λ_v. $90° - L_1 = 58° = 3^h\ 52^m$. $A = 50°$; hence,

$$\begin{aligned} 90° - (\lambda_1 - \lambda_v) &= 32°\ 30' \\ \lambda_1 - \lambda_v &= 57°\ 30' \\ \lambda_1 &= 165°\ 45'\ \text{E.} \\ \lambda_v &= 108°\ 15'\ \text{E.} \end{aligned}$$

The final course, B, is found from (36).

$$\cos B = \sin 49°\ 30' \times \cos 48°\ 45'.$$

$49°\ 30' = 3^h\ 18^m$; hence $B =$ S. 54° E.

Let λ_w be the longitude of the northern vertex, W. Now, as the vertices are 180° apart in longitude, we have:

$$\lambda_w = 180° - \lambda_v = 71° \ 45' \text{ W.}$$

30. *Problem VIII.*—Given the latitude and longitude of the observer, the hour angle and altitude of a known star, to find its computed zenith distance. For use with the Marcq St. Hilaire method.

If an observer at A in Fig. 5 observe the altitude of a star in the zenith of B, the latitude of B is then equal to the declination of the star, the difference of longitude equal to the hour angle, and the great-circle course equal to the azimuth; and formulæ (27), (28), (29), (33) and (34) become:

$$\cos t = \cot(90° - \phi)\tan d, \tag{41}$$
$$\cos(90° - \phi) = \cot t \tan K, \tag{42}$$
$$\cos(L + \phi) = \cot Z \tan K, \tag{43}$$
$$\cos(90° - d) = \sin(90° - \phi)\cos K, \tag{44}$$
$$\cos(90° - h) = \sin(L + \phi)\cos K. \tag{45}$$

Example.—$L = 30°$ N., $d = 10°$ N., $t = 4^h \ 49^m = 72° \ 15'$. Find the zenith distance.

Using (41) with Plate II (A), we find $\phi = 60°$. From (44), $K = 70°$. From (45)

$$\cos(90° - h) = \sin(30° + 60°)\cos 70°,$$
$$\cos(90° - h) = \sin 90° \cos 70° = \cos 70°;$$

hence,

$$90° - h = z = \text{zenith distance} = 70°, \text{ or } h = 20°.$$

In this case the body is on the prime vertical.

Example 2.—$L = 40°$ N., $d = 20°$ N., $t = 45° = 3^h \ 0^m$. Find the altitude and azimuth of the body.

Here $90° - \phi = 27°$; $\phi = 63°$; from (41), and from (44), $\cos 70° = \sin 27° \times \cos K$. Hence $K = 41° \ 30'$; and from (45), $\cos(90° - h) = \sin 77° \times \cos 41° \ 30'$. $77° = 5^h \ 8^m$; $90° - h = 43°$, and $h = 47°$.

From (43), $\cos 77° = \cot Z \tan 41° \ 30'$; hence $Z = 76° \ 30'$ or $103° \ 30'$. The azimuth from the tables is $103° \ 56'$.

31. *Problem IX.*—Given the latitude and longitude of the observer, the altitude and azimuth of a known body, to find its hour angle.

The azimuth is found by observing the rate of change of altitude per minute as shown in par. 9.

By Napier's Rules we obtain from Fig. 7,

$$\cos Z = \cot(L+\phi)\tan h. \tag{46}$$

We have also

$$\cos(L+\phi) = \cot Z \tan K, \tag{43}$$

$$\cos(90^\circ - d) = \sin(90^\circ - \phi)\cos K, \tag{44}$$

$$\cos(90^\circ - \phi) = \cot t \tan K. \tag{42}$$

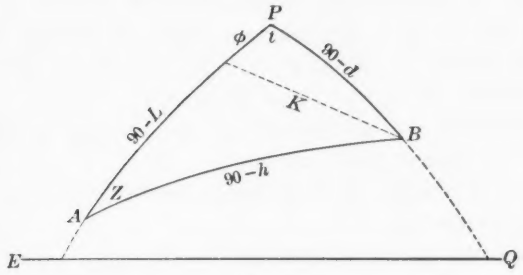


FIG. 7

Find $L+\phi$ from (46), K from (44) or (43), and finally t from (42), using Plate II (A).

Example.—Given $L=35^\circ$ N., $d=20^\circ$ N., $h=30^\circ$ and $Z=85^\circ$ 30′. Find the hour angle.

$Z=85^\circ\ 30'=5^h\ 42^m$, and from (46), $(L+\phi)=83^\circ=5^h\ 32^m$. $\phi=48^\circ$; $90^\circ-\phi=42^\circ=2^h\ 48^m$.

In this case K is more accurately determined by using (44) rather than (43), as with the latter the co-ordinates intersect near the point of convergence, and it is to be noted that one of the chief points of advantage that this graphic method has over those by computation is that unfavorable conditions of a problem are shown on the diagram at a glance, while they are not always so apparent when a single element is computed from a formula.

$90^\circ-d=70^\circ$, and from (44) $K=60^\circ$; then from (42) $t=66^\circ\ 45'=4^h\ 27^m$, and the same result was obtained from Johnson's Tables.

32. *Problem X.*—To find the latitude from an altitude of a heavenly body observed at some distance from the meridian, the local time of observation and the longitude of the place being given. (See pages 121 and 122, Coffin's Navigation.) We have:

$$\cos t = \cot\phi'' \tan d, \tag{47}$$

$$\sin\phi'' \cos(90^\circ - h) = \sin d \cos\phi', \tag{48}$$

Find the hour angle of the body; then from (47) and Plate II (A) find ϕ''; and from (48) and Plate III find ϕ'. $L = \phi'' \mp \phi'$.

"Here, observing that + and − may be rendered by N. and S. respectively, we mark ϕ'' N. or S., like the declination, and ϕ' either N. or S.; then the *sum* of ϕ'' and ϕ', when of the *same* name, or their *difference*, when of *different* names, is the latitude, of the same name as the greater. There are two values of L corresponding to the same altitude and hour angle, but which, *unless* ϕ' *is very small*, will differ largely from each other; so that we may take that value which agrees best with the supposed latitude (at sea the latitude by account). When $t > 6$ hours, $\phi' > 90°$, as in (74).

"ϕ' is positive if $Z > 90°$, and negative if $Z < 90°$; the sign of ϕ' may therefore be determined by the bearing of the body." (Coffin's Navigation, page 122.)

ϕ' is marked S. when the body bears northerly, and N. when the body bears southerly.

Example.—In latitude about 40° S., $h = 30°$, $d = 20°$ N., and $t = 1^h\ 0^m$. Find the latitude.

$t = 15°$, and from (47) and Plate II (A), we find ϕ'' 20° 35′ N.
From Plate III..... $\phi' = 59°\ 0'$ S.
$L = 38°\ 25'$ S.

The computed value of the latitude is 38° 19′ S.

33. It is evident that the size of the diagram may be sufficiently increased without being inconvenient to handle, so as to give the quantities sought to within a minute of arc of the true value. For use in great-circle sailing it may be convenient to extend the diagram to include co-ordinates up to 180°, and thus avoid confusion in regard to the signs of the functions. The writer proposes to prepare a diagram on a sufficiently large scale to meet all requirements. The solutions here given were obtained with the aid of a pair of dividers and a scale of equal parts, by which the interpolation was done, and with a little practice the results may be obtained very quickly.[1]

A slide rule could be constructed with three slides, on which all the problems given under Plates II (A) and III, as well as others, could be solved; but it is thought that in practice the diagrams will be found more convenient and just as accurate.

[1] Plates I, II, and III have been reduced one-third.

Problem XI.—To identify an unknown star, given the latitude and longitude of the observer, the Greenwich mean or sidereal time of observation, and the altitude and azimuth of the star.

From the triangle *MDZ*, Fig. 8, we have:

$$\cos Z = \cot(90° - h)\tan \phi'. \qquad (47\,a)$$

In Fig. 8, ϕ is the polar distance, *PD*, and ϕ' is the zenith distance, *ZD*, of *D*, the foot of the perpendicular, *K*, from *M* to the meridian, *PZ*. Hence $90° - L = \phi \pm \phi'$, and if $\phi = 90° - \phi''$ we have:

$$L = \phi'' \mp \phi' \quad \text{or} \quad \phi'' = L \pm \phi'. \qquad (47\,b)$$

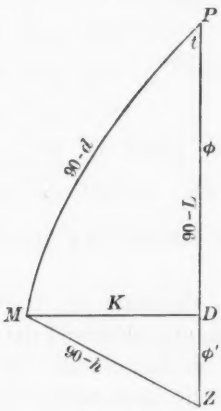


FIG. 8

Also

$$\sin \phi'' \cos(90° - h) = \sin d \cos \phi', \qquad (48)$$

and

$$\cos t = \cot \phi'' \tan d. \qquad (47)$$

We have, therefore, the following solution:

Find ϕ' from Plate II (A), with formula (47 a), and ϕ'' from (47 b); then find the declination from Plate III with the aid of (48), and the hour angle from Plate II (A), with (47).

Example 1.—At sea, August 10, 1904, about 5.30 a. m., Lat. 11° 30′ N., Long. 81° 9′ W., the true altitude of a star was 25° 55′, bearing S. 65° E., true. Find the name of the star, the Greenwich sidereal time of observation being $8^h\ 12^m\ 17^s$.

Here $L=11°\ 37'$ N., $Z=$S. $65°$ E.; $65°=4^h\ 20^m$; $h=25°\ 55'$; $90°-h=64°\ 5'$.

$$\cos Z=\cot(90°-h)\tan\phi'. \tag{47 a}$$

From Plate II (A), we find $\phi'=+40°$, but $L=\phi''+\phi'$; hence $\phi''=-28°\ 23'$, which shows that the declination of the star is S.

From Plate III, using

$$\sin\phi''\cos(90°-h)=\sin d\cos\phi', \tag{48}$$

we find $d=16°$ S.

We may find the hour angle from (47) and Plate II (A) or from formula (1) given on Plate III, using the value of the declination found from (48). We thus find $t=3^h\ 50^m$.

G. S. T.	$=8^h\ 12^m\ 17^s$
Long., West	$=5^h\ 24^m\ 36^s$
L. S. T.	$=2^h\ 47^m\ 41^s$
Star's hour angle	$=3^h\ 50^m\ 0^s$ (East)
Star's R. A.	$=6^h\ 37^m\ 41^s$

and from the Nautical Almanac we find that the star is α Canis Majoris (Sirius).

Example 2.—At sea, February 26, 1901, 6.30 p. m., L. M. T., weather overcast and cloudy, observed the altitude of an unknown star through a break in the clouds, $29°\ 30'$ (true); bearing, N. $74°$ W. (true); Lat. by dead reckoning, $35°\ 0'$ N.; Long. $60°$ W. What is the name of the star?

From an examination of Plate III it will be seen that when either ϕ' or the declination is small the conditions are unfavorable for an exact solution with this diagram, due to the convergence of the lines. In such cases we may proceed thus:

Find ϕ' from (47 a) as before, marking it N. when the body bears to the southward, and S. when the body bears to the northward. Here we find $\phi'=26°$ S., or $-26°$. From Fig. 8 we find:

$$\cos(90°-\phi')=\cot Z\tan K. \tag{47 c}$$

But $\cos(90°-\phi')=\cos 64°$; $Z=74°$; hence $K=56°$.

In the triangle PMD, Fig. 8, we have:

$$\sin\phi=\cot t\tan K, \quad \text{or} \quad \cos(90°-\phi)=\cos\phi''=\cot t\tan K. \tag{47 d}$$

$L=\phi''+\phi'$, algebraically; hence $\phi''=+61°$, and $t=72°=4^h\ 48^m$. Then from (47) we find $d=28°\ 36'$ N., because ϕ'' is + or N. We find from the hour angle that the right ascension is $0^h\ 4^m\ 40^s$; hence the star is α Andromedæ, R. A. $=0^h\ 3^m\ 19^s$, Decl. $=28°\ 33'$ N.

THE REDUCTION TO THE MERIDIAN

34. The use of the mean azimuth to find the rate of change of altitude per minute, in order to determine the altitude corresponding to a given hour angle or *vice versa,* is general in its application, and may be used for the solution of the ordinary "Ex-Meridian Problem."

Problem XII.—To find the "Reduction to the Meridian" and the meridian altitude of an observed body, given the latitude by account, declination, hour angle and altitude of the body.

The azimuth may be found from the Azimuth Tables, or in the following manner:

Let $\Delta_1 h$ = change in altitude in one minute from meridian passage, in seconds of arc, which is tabulated in the various Ex-Meridian Tables.

t = hour angle in minutes.

$\Delta_t h$ = the reduction to the meridian in minutes of arc corresponding to the hour angle t.

R = change of altitude per minute at time of observation.

Then near the meridian, within the "limiting hour angle," that is, when the second reduction to the ordinary "Reduction to the Meridian" as found from Delambre's formula is practically 0, we have:

$$R=\frac{\Delta_1 h \times t}{30}. \qquad (49)^1$$

Enter Plate I with R and L and find Z. Let R_{z_1} = change of altitude in one minute in minutes of arc corresponding to the mean azimuth, $Z_1=\frac{1}{2}(Z+Z_2)$.

Then from (6) we have, disregarding the negative sign:

$$R_{z_1}=15\cos L \sin \tfrac{1}{2}(Z+Z_2). \qquad (50)$$

For the "Reduction to the Prime Vertical," $Z_2=90°$, and then

$$R_v=15\cos L \sin \tfrac{1}{2}(Z+90°). \qquad (51)$$

[1] See page xii, formula (22), Ex-Meridian Tables by the writer.

For the "Reduction to the Meridian," $Z_2=0$, and we have:

$$R_m=15\cos L \sin \tfrac{1}{2}Z. \quad (52)$$

$$\text{Reduction to the Meridian } \Delta_t h=R_m\times t. \quad (53)$$

Hence, from (52) and (53) we have the following rule to find the "Reduction to the Meridian":

Enter Plate I with one-half the azimuth of the body and the latitude by account. The "change of altitude in one minute" thus found, multiplied by the number of minutes in the hour angle, gives the "Reduction" to be applied to the observed altitude to obtain the meridian altitude at the place of observation.

If preferred, in case extreme accuracy be desired, R_m, may be found from Captain Lecky's "D" Tables by entering with L and $\frac{1}{2}Z$ as arguments and taking out N; then:

$$R_m=\frac{15}{N}, \quad (54)$$

and

$$\Delta_t h=\frac{15}{N}\times t. \quad (55)$$

(See pars. 7 and 9.) When the hour angle is large the accumulated error due to the error in R_m, N being given to three decimal places only, becomes appreciable.

Example 1.—$L=40°$ N.; $d=0$; $t=40$ minutes; $\Delta_1 h=2.34'$. Observed altitude $=48°\ 58'$. What is the meridian altitude?

Here

$$R=\frac{2.34'\times 40}{30}=3.12'. \quad \text{(See (49).)}$$

From Plate I, using the enlarged portion near the meridian, we have:

$$Z=15°\ 20';\ \tfrac{1}{2}Z=7°\ 40' \text{ and } R_m=1.55'.$$

Hence:

$$\text{Reduction to Meridian } \Delta_t h=1.55'\times 40=62'.$$

The computed value is 61.7'.

$$\begin{aligned}\text{Observed altitude}&=48°\ 58'\\ \Delta_t h&=\ 1°\ \ 2'\\ \text{Meridian altitude}&=50°\ \ 0'\end{aligned}$$

Example 2.—Latitude, 45° N.; declination, 10° N.; hour angle, $0^h\ 40^m$. Observed altitude, 53° 57′ 30″. Find the meridian altitude.

From Azimuth Tables $Z=17°$; $\frac{1}{2}Z=8\frac{1}{2}°$. From Lecky's "D" Table, $R_m=\frac{15}{9.6}$. Hence:

$$\text{Reduction to Meridian } \Delta_t h=\frac{15\times 40}{9.6}=62.5'.$$

The computed value of the "Reduction" is 62′ 40″.

Observed altitude	= 53°	57′	30″
"Reduction" $\Delta_t h$	= 1°	2′	30″
Meridian altitude	= 55°	0′	0″

A slide rule could be made with which all the problems involving Plate I could be solved, but it is thought that in practice a diagram drawn to the proper scale will be found more convenient.

MAXIMUM AZIMUTH

35. When the declination is greater than the latitude, and of the same name, the position angle, M, should be used for the azimuth and the declination for the latitude in formulæ (50), (51) and (52). Then these formulæ become, respectively, (56), (57) and (58):

$$R_{m_1}=15\cos d\sin\tfrac{1}{2}(M+M_2). \tag{56}$$

For the case of maximum azimuth when $M=90°$:

$$R_v=15\cos d\sin\tfrac{1}{2}(M+90°). \tag{57}$$

For the Reduction to the Meridian, when $M_2=180°$:

$$R_m=15\cos d\sin\tfrac{1}{2}M. \tag{58}$$

Example 3.—Latitude, 30° N.; declination, 65° N.; hour angle, 60 minutes; find the "Reduction to the Meridian."

We find $M=22°\ 18'$; $\frac{1}{2}M=11°\ 9'$. From Lecky's "D" Table $R_m=\frac{15}{12.23}$.

$$\text{Reduction to Meridian}=\frac{15}{12.23}\times 60=73.6'.$$

Computed by the ordinary method, after applying the second correction, the value is 73.8′.

36. *Proof of the Rule for the Use of the Mean Azimuth in Finding the Reduction to the Prime Vertical and to the Meridian.*— In a pamphlet by Naval Instructor H. B. Goodwin, R. N., entitled "The Ex-Meridian Treated as a Problem in Dynamics," he makes use of the following principle:

"If a moving body is subjected to a uniform acceleration in the direction of its motion, the space described in a given time is given by the *mean velocity* during the time multiplied by the time."

It would seem, at the first glance, that this principle might be used for the reduction to the prime vertical as well as to the meridian, but upon closer examination it is found not to hold good, as in order to apply this rule the acceleration must be *uniform*, and this is true only near the meridian and very near the prime vertical, or when the difference of hour angles is very small, as will be shown below; in fact this rule is only a special application of the principle of the mean azimuth. It is only when the acceleration is uniform that the mean velocity is the mean of the initial and final velocities of the body and corresponds to the mean interval between the initial and final positions of the body, and is equal to that corresponding to the mean azimuth. On the other hand, we find that the mean velocity for the interval does in all cases correspond to the mean of the initial and final azimuths of the body, and this rule is general whether the acceleration of the motion in altitude is uniform or variable. Near the meridian the acceleration is uniform and the mean azimuth corresponds to the mean interval, and the special case agrees with the general rule. This is also true very near the prime vertical.

This may be seen from an examination of the curves shown on Plate I, where, near the meridian, the curves are straight lines, and also right at the prime vertical the curve coincides with the tangent.

37. We see from formula (6), $R = -15 \cos L \sin Z$, that the change of altitude per minute in any given latitude is dependent upon the azimuth of the body and varies with the sine of its azimuth only. Hence the change per minute for any given range in azimuth is that due to the mean azimuth. This may also be seen from an examination of Captain Lecky's "D" Table. Therefore:

The space in altitude described by a celestial body in a given time is found by multiplying the velocity in altitude corresponding to the mean azimuth of the body by that time. Hence the following

RULE FOR FINDING THE REDUCTION OF ALTITUDE FROM THE MEAN AZIMUTH

Multiply the rate of change of altitude per minute, in minutes of arc, corresponding to the mean of the initial and final azimuths of a celestial body, by the difference between the initial and final hour angles, in minutes of time. The product is the difference between the initial and final altitudes in minutes of arc.

To find the difference between the initial and final hour angles when the altitudes are given, multiply the time required to change the altitudes one minute, in seconds, by the difference of altitudes in minutes of arc. The product is the reduction of hour angles in seconds of time.

We may now show that the application of the principle of dynamics quoted above is only a special case of the use of the mean azimuth.

Let t = the initial hour angle of the body.

t_2 = the final hour angle of the body.

Z = the initial azimuth corresponding to t.

Z_2 = the final azimuth corresponding to t_2.

R = rate of change of altitude per minute corresponding to t and Z.

R_2 = rate of change of altitude per minute corresponding to t_2 and Z_2.

$R_1 = \frac{1}{2}(R+R_2)$ = mean rate of change of altitude for interval $t_2 - t$.

R_{z_1} = rate of change of altitude per minute corresponding to the mean azimuth, $Z_1 = \frac{1}{2}(Z+Z_2)$.

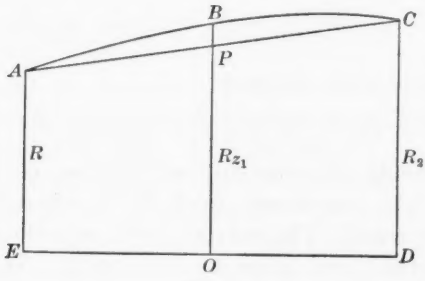


FIG. 9

In Fig. 9, the line ABC represents a portion of any curve shown on Plate I. $AE = R$, $CD = R_2$, $BO = R_{z_1}$, $PB = m$, the intercept on

the ordinate of mean azimuth between the chord and the curve. O is the middle point of the base ED of the trapezoid $ACDE$, or the point of mean azimuth. Draw the chord APC. Then in the trapezoid $ACDE$ we have $PO=\frac{1}{2}(R+R_2)$.

We have the following ordinates to the curve:

Ordinates: R, R_{z_1}, R_2.

First differences: $R_{z_1}-R$, $R_2-R_{z_1}$.

Second differences: $2R_{z_1}-(R+R_2)$.

When the acceleration in altitude from A to C is uniform the second difference is 0, the curve ABC coincides with the chord AC, B falls at P, and $BP=m=0$. Hence

$$2R_{z_1}-(R+R_2)=0$$

and

$$R_{z_1}=\tfrac{1}{2}(R+R_2), \tag{59}$$

in this case. But

$$R_{z_1}-PO=BP, \quad \text{or} \quad R_{z_1}-\tfrac{1}{2}(R+R_2)=BP=m.$$

Hence,

$$R_{z_1}=\tfrac{1}{2}(R+R_2)+m, \tag{60}$$

in all other cases, and therefore the application of the principle of dynamics quoted above is only a special case of the use of the mean azimuth.

This may be shown also from (59). We have:

$$R+R_2=2R_{z_1}.$$

Substituting the values of R, R_2 and R_{z_1} from formula (6) and reducing we get:

$$\sin Z+\sin Z_2=2\sin\tfrac{1}{2}(Z+Z_2). \tag{61}$$

But from trigonometry we have:

$$\sin Z+\sin Z_2=2\sin\tfrac{1}{2}(Z+Z_2)\cos\tfrac{1}{2}(Z-Z_2). \tag{62}$$

Therefore formula (61) can only be true when $\cos\frac{1}{2}(Z-Z_2)=1$, or when $(Z-Z_2)=0$ or is very small; that is, when $Z=Z_2$, or when they are nearly equal. This relation holds near the meridian, near the prime vertical, and when t_2-t is small. An inspection of Plate I will show this. An examination of the Azimuth Tables will also show that it is only near the meridian, very near the prime vertical, or when t_2-t is small that the mean azimuth corresponds to the mean hour angle.

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THE DIPLOMATIC RESPONSIBILITY OF THE UNITED STATES NAVY

By Rear Admiral Bradley A. Fiske, U. S. Navy

From the earliest times navies and armies have been used to support the diplomatic policies of countries.

The necessity of men to unite in tribes, clans and nations for mutual protection and the defence of their common interests, was recognized even in barbarous days. The protection sought, and the power required, came by means of men armed with the weapons of the age. Because of the difficulty of transportation, the various bodies of men dealt only with other bodies not far away, and with them the intercourse was but casual and slight.

As time went on, as means of transportation improved and weapons increased in accuracy and range, the power of armies became greater, tribes and national organizations increased in size, inter-communication became more frequent and more intimate, and the use of ambassadors became gradually established.

The use of ambassadors, ministers, and other diplomatic agents began in the early stages of civilization and continues to the present day; but the quickness and sureness of communication, brought about by electrical and mechanical inventions, has put ambassadors and ministers much more under the immediate control of their home governments than before, with the result that their power and responsibility have decreased.

Ambassadors and other diplomatic agents act as mediums of communication between governments. Of themselves they can exert no force. They cannot now sign treaties except on terms dictated by their governments. They may persuade, they may even threaten, but that is all. An ambassador acts under the authority of the sovereign through the foreign office; but he cannot perform any act of war, or of himself commit his government to any war, or to any other act or policy.

So long as the relations between two powers remain friendly, so long as their interests and policies do not conflict, the use, or show, of armed force by either is not needed. But behind each ambassador is, and must be, the armed force of his country, or, in some cases, the armed force of some other country. Unless this armed force exists, the arguments and persuasions and threatenings of an ambassador are without influence or effect.

Among the continental countries of Europe in modern times and among most countries in the past, armies have been the fundamental means by which governments have exerted pressure on each other; but among countries separated by the sea, navies are increasingly used for this purpose, and during the last two centuries they have been used with great effect.

So long as the relations between two maritime powers have been friendly, so long as the situations have been easy to manage, navies have not been used, or even explicitly suggested. But the moment that the situation has become difficult, ships of war have been demanded; and ships of war have usually been sent.

It would require too much time and space to specify times, incidents and places. But Paullin's "Diplomatic Negotiations of American Naval Officers" which describes, of course the negotiations of only one navy, shows what an intimate and important relation navies have borne to diplomacy—intimate and important, yet unrecognized.

A careful perusal of this book will prove that not only has the diplomatic character of navies, especially the United States Navy, been a fact, but that in many diplomatic questions of real difficulty and real importance, the navy has exercised a most potent function, and sometimes the most potent function, in reaching the final result attained. And not only this, but in a very large proportion of the cases, the navy officer in command, though usually of a rank far below that of the accredited diplomat, has shown a grasp and diplomatic skill at least equal to that of the accredited diplomat, who has sometimes been a man possessed of little diplomatic knowledge or experience.

To realize this fact, it must be borne in mind that the naval officer has always had to act on his own individual responsibility, never under the diplomatic officer, but only in co-operation with him, under orders from the Navy Department, which from the very nature of each case, have had to be of the most general description.

Paullin's book brings down our naval diplomatic history to 1883. Since that time, the use of war ships in diplomacy has increased. The commanders of our ships, especially in Asia, the West Indies, Mexico, Central America and South America, have handled delicate diplomatic questions continually, and always with success. Possibly this truth has been exemplified in San Domingo more often than in any other country; for there the circumstances have been such that in numerous cases, the final application, or threatening, of actual force has had to be made by the naval officer; often under circumstances so urgent that he did not have time to communicate with the Navy Department, or even with the minister.

One of our most important successes was that gained by Rear Admiral Benham in Rio in 1894. Still another occurred in Manila in 1898. Admiral Dewey there found himself confronted with a situation which for complexity and possibility of disaster had no superior in our history. Fortunately he was great in peace as well as war; with the result that for more than a year he handled a succession of difficult problems with a diplomatic insight, foresight and ability that no civilian American statesman has surpassed.

In the popular mind, navies are associated with armies; but the events of the past few years have given navies more and more a diplomatic character, and thrown them more and more into intimate relationship with the diplomatic service, and less and less into intimate relationship with armies. This statement is true of all navies, but is especially true of the navies of two countries isolated from others by the sea, Great Britain and the United States.

One cause of this change is the enormously greater power of modern navies relatively to modern armies, due to the increased size of ships and the armaments they carry. Another cause is the increasing ease and quickness with which warships can be despatched to distant places, to support the policies of diplomacy. Another cause is the stabilizing effect on international relations of the modern practice of maintaining navies in a state of constant readiness for war.

In all great maritime countries, the relations of the navy and the Foreign Affairs Department are always of the closest kind, both in war and peace. In the United States, not a day passes

without the exchange of letters and verbal messages between the State and Navy Departments concerning matters of great importance. But, except in time of war, the army and navy rarely act in concert, and their officers meet officially on rare occasions only.

Among certain nations, during the last half century, the rise of civilization has reached a point far beyond the imagination of even the more recent past. Coincident with this rise in civilization has been an increase in the comforts and luxuries of living. This has brought about an increasing distaste for hardship, an increasing horror of pain, and an increasing disinclination to take part in war. This disinclination is more marked in some countries than in others, and is especially marked in the United States.

The fact that any country is markedly disinclined to war makes that country extremely responsive to pressure exerted by a country which is not so disinclined. This necessitates a greater navy than would otherwise be required, in order to overcome the diplomatic handicap produced.

For this reason, and for the further reason that our present navy would be inadequate even if we were not disinclined to war, the position of the United States is one of real danger; and this danger is combined with another danger, caused by the fact that, though our consular service is beginning to have a certain continuity, our diplomatic service has no such continuity, except in the lower ranks, and therefore our diplomats cannot acquire the training that would best fit them to cope with the highly trained diplomats of foreign powers.

This unfortunate combination puts a grave responsibility on us; for, although our profession is primarily military, it is diplomatic as well, and we are the only body of men in the United States who combine diplomatic training with continuous existence, and on whom the country must continuously rely.

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A GERMAN VIEW OF THE STRATEGIC IMPORTANCE OF THE PANAMA CANAL[1]

By Dr. F. Zadow
Privatdozent of the University of Greifswald

Translated by Lieut. Commander E. J. King, U. S. Navy.

Translator's Note.—The author first gives a brief history of the proposals for a canal and the attempts to construct one. He then takes up the economic importance of the Canal, pointing out that its economic value is greatest for trade bound to and from the west coasts of South and North America, from and to European and eastern United States ports, and that it is most of value to the United States in this respect. He remarks that England and Germany must keep a careful lookout in order that they may get their shares of the trade which is to pass through this new international highway. He concludes this part of his article with the characteristic German expression "Deutschland sei wach" (Germany on guard!). He then takes up the strategic importance of the Canal in the following manner:

The political importance of the Panama Canal is greater than its economic value; it was not built primarily as a trade route but as an instrument of war. Without the Canal the United States could only arrange for adequate protection to both its Atlantic and Pacific coasts by means of two fleets; upon the completion of the Canal a transfer of the one fleet or of a part of it from the one ocean to the other will be a matter of but a few hours, whereas formerly it took many weeks. The United States also saves the enormous expense of constructing a second battle-fleet, in which must be included the saving in fuel, stores, personnel, and the cost of up-keep.

Of course the Panama Canal will retain its strategic importance only as long as it has no rivals. If, for example, any other

[1] Extracted and translated from an article entitled "The Economic and Strategic Importance of the Panama Canal," appearing in *Ueberall* (Berlin) for February, 1914.

power were to build the Darien Canal or the Nicaraguan Canal and make it secure in a military and political sense, the importance of the Panama Canal in international affairs would be materially lessened, as the United States could not then control the passage from ocean to ocean of the war- and trade-fleets of the interested nations. The possession of such a canal by a foreign power would enable an enemy fleet to effect the change from one ocean to the other without either the knowledge or the consent of the United States and would afford to their opponents the means whereby to effect a surprise and to compel the United States to divide its forces. However, the completion of the Panama Canal itself should definitely put an end to all possibilities in the shape of rival canals.

A similar effect could be produced by the simultaneous attack of two large co-operating fleets, one in the Atlantic and one in the Pacific, even when the Panama Canal is the only one in existence. It is for this reason that the English-Japanese as well as the Russo-Japanese alliance is of such unpleasant importance to the United States, for both alliances are suitable, in case of war, to bring into question the strategic value of the Panama Canal, by means of joint action of the allied fleets. Hence the endeavors of United States foreign policy to effect arbitration treaties with England and with Russia without depending solely upon racial dissimilarities to make the alliances of merely nominal worth.

From the foregoing premises it may be clearly seen that in strategical considerations lies the importance, to the United States, of those countries (Mexico, Central America, Colombia) in whose territories it is possible to construct canals; with these considerations in mind, the political happenings in those countries are better understood. Thus may be explained the revolt of Panama from Colombia; the next to the last insurrection in Mexico, which occurred when that country wished to enter into an alliance with Japan; the efforts made by the United States to prevent the yellow races from obtaining a foothold in these countries; and finally, the persistent endeavor of the United States to extend the Monroe Doctrine[2] to include Central and South America.

[2] TRANSLATOR'S NOTE.—Germany has never acknowledged the Monroe Doctrine; it is apparently not any too well understood in Germany, even in those quarters where it should be thoroughly comprehended.

In recognition of the fact that strategical superiority can only be maintained while the United States not only controls the Panama Canal politically but while it is defended against sudden attack by sea, the Canal is protected on both coasts by extraordinarily strong fortifications of the most modern design.

As far as distances enter into consideration there may be cited the following strategical data:

1. From San Francisco the Pacific fleet commands the entire coasts of America and the islands adjacent to the coasts; but of the oceanic islands it commands only the Hawaiian group; the remainder of the Pacific Ocean lies within the sphere of control of Japan.

2. Without the Panama Canal the Atlantic fleet, proceeding around South America, could only get as far as Valparaiso before the Japanese could reach the same point.

3. After the Panama Canal is opened the Atlantic fleet will command South and North America as far north as San Francisco and could join the Pacific fleet there unharmed. The Atlantic fleet is nearer to Central and South America than is the Pacific fleet.

From the foregoing data it is evident that the completion of the Panama Canal will furnish the United States with an important increase of strength on its west front, *i.e.*, towards Japan. Had Japan been thinking seriously of war with the United States she should not have waited until the time of the opening of the Panama Canal. It is not a sufficient answer to say that the Japanese fleet would be so much stronger at the time the first American man-of-war traverses the new waterway that it could then encounter the United States on more even terms. The fact is that Japan, with her overmastering desire for expansion, has suffered a severe setback through the opening of the Panama Canal.

From the obvious strategic considerations it is also manifest that the influence of the United States on the republics of South America will increase, as they will become, on account of the Canal, politically more dependent on the United States, *e. g.*, the case of Colombia, which, without a canal of her own and without allies, either must have two fleets or must remain assailable on two sides, and therefore is more dependent than before the opening of the Canal. It will depend largely upon the skill of the

diplomats and financiers of the United States whether Colombia, the possessor of the Isthmus of Darien, organizes a political union of the nature of a "Latin Confederacy," composed of the adjacent states, or merely organizes them economically against the United States.

The Panama Canal is also important to the entire Pacific Ocean lying beyond the American continents and especially so to the colonial possessions of the United States. The Americans will become, in a military sense, independent with respect to the Philippine Islands, which are of such paramount importance for naval bases, coaling stations, cable stations, etc. Although the Samoan Islands are only of moderate strategic importance, the Hawaiian Islands comprise the principal station on lines of operations leading towards Asia and Australia. The possession of the Hawaiian Islands is equivalent to mastery of the Pacific. The United States is now establishing on the island of Oahu a fleet-base (Pearl Harbor) of extraordinary strength and importance; the first blow of Japan would apparently fall on this base. As the distance from New York to Pearl Harbor is reduced from 13,280 miles via the Straits of Magellan to 6726 miles via the Panama Canal, it is evident that the position of the United States is materially strengthened in the Pacific.

In the event of war between the United States and European powers the Panama Canal will not be of great strategic importance, as in such case—because of the importance of the east coast of the United States—the decision will take place in the Atlantic. In the case of a common goal in the Indian Ocean or in eastern Asia a fleet going out from Europe via the Suez Canal would have a material advantage; the route via the Cape of Good Hope is also more favorable for European countries, as they have colonies and bases en route which the United States wholly lacks. On the other hand, the harbors of the British colonies of Australia and New Zealand will be brought much nearer to the center of power of the United States than to the mother country, a situation that will not facilitate British policy in the Pacific. It should be remembered that England can, in case of war, and in spite of all declarations of neutrality, use her own judgment to deny use of the Suez Canal and thus monopolize the traffic through it for her own sea-borne trade; the Panama Canal now changes England's commanding position in respect of world

traffic in that it affords to other countries a second highway to the Far East, and one that is not under British control. Because of the Panama Canal, England's influence, hitherto paramount throughout the world, will be decreased in the first instance and in a geographical sense with respect to the eastern shores of the Pacific Ocean and in the South Seas; however, her command of the sea in other parts of the world will not be affected, as she possesses strong strategic positions; on the one hand, along the Suez Canal route and in Africa and eastern Asia, and on the other hand, in Canada and in West Indian waters.

Inasmuch as the high-tensioned economic rivalry of nations inevitably brings war into play to render the final decision, sooner or later there must come, as nearly as human judgment can predict, a decisive conflict in the Pacific. It is certain that the extraordinary strengthening of the strategic position of the United States, and of the maritime power thereby created, in immediate proximity to the Japanese Empire, presents an obvious war danger which is openly prepared for in the United States, while in Japan the preparations are secret. Thus it is seen that the Panama Canal which, following the conquest of the Philippines, indicates the progress of the United States in carrying out its present-day paramount, imperialistic policies, will soon be the cause of a tremendous conflict, and of the resultant decision.

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A SUGGESTION FOR THE USE OF BATTLESHIPS IN RESERVE

By LIEUTENANT F. A. SAVAGE, Maryland Naval Militia

This paper is offered as a suggestion that battleships in reserve be utilized both as auxiliary recruiting stations for the navy, and as bases for training the naval militia.

Ships are placed in reserve because of a shortage of officers and men—they are kept together in the navy yards as a measure of economy both from the standpoint of supervision and maintenance. It is argued that if assigned to separate stations it would result in the deterioration of the vessel, a reduced efficiency and readiness for sea, because of a lack of supervision by the commander-in-chief of the reserve fleet, and because, if detached, they would be deprived of the benefits of the reserve fleet routine and methods and of the advantages of a fresh water basin.

The question arises, however, as to whether the advantages of economical upkeep could be offset by greater advantages to the service if some of the ships were detached and assigned to the principal seaboard cities for the purposes mentioned in the opening paragraph of this paper.

Navy recruiting offices are maintained in most of our large cities, and the duty of the recruiting officer is primarily that of securing recruits. The methods now employed are not criticised, but on the contrary are believed to be as effective as the present system permits; the question involved, however, relates to a possible improvement of this system.

Well written and attractive advertisements appear in the daily papers—men are invited to send for circulars or to call at the recruiting offices for information. The circulars paint glowing pictures of naval life—the attractions of the sea, the advantages of steady employment, etc.

The great business men of the day who make a specialty of advertising, recognizing the difference between ocular and oral impressions, devote their main efforts towards the former; pictures are shown of merchandise offered for sale, its method of use and of manufacture, and everything possible is done to bring the advertised article within the vision of the prospective purchaser.

The army has uniformed men not only at the doors of their recruiting offices, but also on the streets in front of government buildings, for the purpose of distributing circulars and answering questions; while the navy has an advantage in the seaboard cities which is far greater than is apparently appreciated, and an opportunity presents itself which is impossible with the army.

Navy recruiting offices are usually located in the business district, not always on the ground floor, and not always in an attractive location. First impressions are always important, but if the prospective recruit were not met by men in uniform, he might easily imagine himself in any business office; for aside from the uniforms there is nothing nautical about the average recruiting office. The applicant is told what the navy will do for him, but at the time he is not much interested in what he can do for the navy, and patriotism plays an unimportant part in his calculation. He hears what is said, and paints a mental picture of his future life aboard ship.

If instead of, or if in addition to, a recruiting office in the business district, a battleship were anchored in the harbor, how much stronger would be the picture! Instead of simply hearing about the ship he would have an opportunity to see one, and to go on board one for perhaps the first time in his life. He would form conclusions based on the things he saw with his own eyes, rather than depend entirely on what he was told.

Naval officers probably do not realize how few citizens have ever seen a battleship at close range, and how very few of our young men have ever had the opportunity to go on board one.

A battleship in the harbor would attract visitors in great numbers, the newspapers would advertise it, and the number of recruits should be largely increased. The ship would not only attract men in the city, but it would attract men from adjacent towns who, under the present circumstances, know practically nothing about a war vessel.

Men would see the life as it is under service conditions; it would be brought home to them, and the ship would attract many men who would not be attracted to a recruiting office in the business district.

In some cities it might be possible to have the ship secured to a dock. Such an arrangement would for many reasons be desirable, provided a suitable location were available, but there are many advantages in having the ship at anchor in the harbor. The question of transportation would be involved, but on the other hand it should be remembered that the object in view is to attract men who may not be familiar with a ship, and a battleship is certainly much more impressive at anchor than when lying alongside a dock. A ship at anchor would be seen by more people than if she were docked, and, in addition, a trip to the ship would constitute an attraction which would appeal to men more than boarding the same ship from a dock.

It would not be long before people would become accustomed to the visiting hours, and the privacy on board a ship at anchor during off hours would probably compensate for the inconvenience of frequent shore trips.

The more the public knows about the navy, the better for the navy. Practically every man who would see the ship is a voter, and these voters elect the members of Congress who appropriate the people's money for the building and maintenance of our ships. Men who never saw a ship cannot be expected to show the same interest as those who have seen and been aboard one. It is the difference between the tangible and the intangible, and whether the visitor be a prospective recruit or merely a voter, some good would be accomplished by a personal knowledge of conditions.

It is true that our battleships and destroyers have paid occasional visits to many of our large cities, and it is well known that such visits have increased the number of applicants for enlistment. The naval review in New York was heralded by every newspaper in the country, and thousands of people saw a war vessel for the first time.

If this is true of occasional visits, how much more effective would it be if a ship were lying at anchor in the harbor to be seen by every man, woman and child who enters or leaves the city on excursion boats or merchant vessels!

It is confidently believed that the effect would be of unquestionable value, and if arrangements could be made to use the ship as a training base for the naval militia at ports where such organizations exist, the efficiency of the naval militia would be largely increased.

The crying need of the naval militia is greater experience on board ship, and what better opportunity could be offered than by combining a floating recruiting station for the navy with a training school for its reserve? If occasional drills could be held on a battleship in addition to the regular drills in an armory, it would enable the militiamen to become familiar with a ship of the type to which they might be assigned in case of war. Each man could have his station number and be trained in the particular duties which would be expected of him should the ship be called into action.

If the commander of each naval militia organization were given a watch, quarter and station bill showing the numbers to be supplied by the militia for a particular ship, he would know just what was expected of his organization. It would increase activity and interest in the militia; it would give them something definite to accomplish and be a tremendous stimulus towards effective organization.

The naval militia is composed of men whose time is more or less occupied during the day and whose opportunity for military training is necessarily limited. It is essential for this reason that the training during the time at their disposal be made as effective as possible.

Certain results are as capable of accomplishment in an armory as on board ship, but although the theory and, to a limited extent, the practice of ship routine may be taught in the armory, it is surely desirable that the training be supplemented by actual conditions aboard ship.

During the winter months drills are held in the armory once a week from 8 or 8.30 p. m. to approximately 10 p. m. These drills are compulsory, court-martial and fine being the penalty for non-attendance, but even though drills are compulsory, it is the object of the officers to make them not only as instructive but as interesting as possible; the men are not paid for attendance, but are given frequent entertainments of a social or of an athletic nature; they are encouraged to use the shooting range at every available opportunity and to engage in competition with other divisions.

If a battleship on which the men were made to feel more or less at home were lying at anchor in the harbor, the inducements held out for enlistment in the naval militia would be much more apparent. The ship would supplement the work done in the armory and would be of incalculable value towards developing an interest in the militia.

Although this paper lays considerable stress on the advantages to the navy from a recruiting standpoint, it is believed that the interests of both the navy and the naval militia would coordinate to mutual advantage.

Nearly all the naval militia organizations have the use of small vessels for week-end cruising purposes, but if the militia should ever be called upon to fill out the complement of our reserve fleet, it seems desirable that they should be given every possible opportunity to familiarize themselves with a ship of larger type.

Our ships in reserve not only require an additional deck force, but also need engineers, firemen, electricians and telegraphers, and such technical men would be attracted to the militia if greater opportunity were afforded them to come in contact with actual conditions and with service men of similar ratings.

If ships in reserve were utilized in this manner it would bring the public in closer touch with the navy; it would bring ex-service men, seafaring men and citizens of a special class in touch with the service, and would facilitate the preparation of ships now in reserve for active service on short notice.

DISCUSSION

The Great Lesson from Nelson for To-day

(See Page 295, Whole No. 150, Vol. 40, No. 2, March-April, 1914)

Lieut. Commander H. Laning, U. S. Navy.—To any one who has been "playing the game," even for the short time that I have, the necessity of having a "method," as Lieut. Commander Knox terms it, or a "system," which seems to me to better describe it, is apparent. Every organization for a contest, either in sport or in war, depends for success either on overwhelming strength or on a team organized and trained on a "system" that will allow it to seize every advantage for offence and, when necessary, to take the strongest possible position for defence. It would be a poor football team that, before each offensive play, had to be called together and each member instructed as to what he had to do; and it would be certain of defeat if, after its opponent started an offensive play, the captain had to instruct each man what he should do to meet that play. It is much more necessary in a war contest that each unit should do its part correctly, for the stake may be the very life of the country. It therefore, behooves the team captain to organize his force as a whole. As the prime physical condition of a team-member is the first requisite for a contest, so the physical condition of any unit of a fighting force must be developed before that unit is ready to take its place on the line. Complete interior organization in the unit must be developed and the unit trained to strike its blow quickly, effectively and with all its strength. In this respect our individual members are well developed, thanks to a system of competition thought out and put in force through the efforts of Captain Sims. But this is only the first step. What good is the individual strength if the individual cannot be put in a position to deliver his blow? When the contest starts each unit or combination of units must know the part each is to play. Not a hard and fast part that presupposes the opponent will try any particular method of attack, but one that will meet in the best way *any* attack the opponent may make and that is able to seize every opportunity to attack the opponent's weak spot and hammer through it to victory. How can we attain this condition? Lieut. Commander Knox has pointed the way. We see his idea worked out constantly in every organized athletic team and we must have it in our fighting teams if we are to have success. Call it "method," "system," or what you please, it must be put in force. "The Great Lesson from Nelson for To-day" has pointed the way and if we, on whom the responsibility lies, do not heed these lessons, then on us must rest the blame if our team goes down to defeat. The rank-and-file of us are ready to follow and to prepare ourselves for the proper

handling of the members of our team. Will the leaders not put us in the way of doing so by *educating, training, indoctrinating, inspiring loyalty, giving us initiative, and formulating and disseminating the plans,* and thus *stimulating the morale* of the individuals, that our fighting team may be a team capable of successfully meeting any opponent at any time.

REAR ADMIRAL B. A. FISKE, U. S. Navy.—The prize essay by Lieut. Commander Knox enunciates clearly and inspiringly one of the most important phases which the advanced military and naval thought of the day is taking on. To those officers who have been in recent touch with our Naval War College, the ideas themselves are not broadly new; but, even to them, the essay can hardly fail to clarify the understanding and strengthen the faith that is within them. To others it must prove of even greater value and let in a flood of light upon a subject which to many is still comparatively dark.

But to us all a little caution seems advisable lest we gather the idea that, because "intelligent co-operation is of infinitely more value than mechanical obedience," obedience is, therefore, of no value. Let us hold fast to the truth that obedience is just as valuable as ever; that the very "intelligent co-operation," talked of in this essay, is obedience of itself—obedience of the highest and purest kind.

Certainly it is advisable to bear in mind that, before a modern battle, the difficulty of foreseeing and of indicating to subordinates the intentions of the commander-in-chief in various possible contingencies will be greater than in Nelson's day, because there will be more kinds of things that could happen than could happen then. Let us remember too that the radio will give the commander-in-chief a means which Nelson did not have of giving commands. And these commands must be obeyed. Obedience is needed even in the football squad in which only eleven players are engaged. The players know each other intimately and they work within a few feet of each other; and yet the necessity for signals exists, and signals are continually employed. That is, commands are needed, commands are given, and obedience is required. Intelligent co-operation does not meet all the requirements of even a football team.

Let us develop intelligent co-operation to the highest point; to the point of telepathy if possible. But let us realize that in the naval battle of to-morrow, situations will occur and emergencies must be met which no human foresight can possibly have foreseen; that intelligent co-operation will help each man to carry out the wishes of the commander-in-chief, but that, nevertheless, the commander-in-chief will receive sudden bits of information which he did not expect, which he did not indicate to his subordinates and which require that important steps be taken at once. To meet such situations explicit commands and implicit obedience are the most efficient measures.

The "doctrine" is doing good work and is going to do more and more good work as it becomes better and better understood. But let us be careful not to over-estimate its scope, and not to overwork it, especially at the start.

CAPTAIN B. C. DECKER, U. S. Navy.—The essay develops, from Nelson's career, the broad lines along which naval officers, seeking to prepare themselves for the duties of high commands in war, must progress.

Nelson in the preparatory period of his career served under no mean master. His first reflections and thoughts on the necessity of "common emulation" after Hotham's action must have been fixed by the battle of Cape St. Vincent, and the approval of his action by Admiral Jervis. We find many indications that Jervis applied the "method" to a degree, giving to Nelson a freedom of action and support that was the forerunner of what Nelson gave his subordinates.

Nelson's career illustrates the two sides of the picture. The heartiest loyalty was shown to Jervis, while to Keith his action is mildly termed, disobedience of orders.

The full stature that Nelson attained was the result of a growth amidst scenes of war. As he studied and meditated upon the games that were played out before him, time made him master of the lessons they taught.

This growth of Nelson is shown by Mahan, and should be a source of encouragement to us all, and will be if we realize that much of this growth was due to lessons that we now have opportunities to learn.

The education that the captains received on the quarter deck of the flagship can be gained through the Naval War College. Nelson could give his officers no more of the art of war than the War College gives to-day. The application of that knowledge depended, then as now, upon the individual.

This education did not make hard fighters of his captains, but it did make intelligent fighters, and men that knew the value of concentrated supported fighting.

No lessons are more thoroughly taught, and the beneficial results more clearly shown by the Applicatory System of Training officers in naval warfare than the first six so carefully and convincingly elaborated by the writer from Nelson's career, viz.: Education, training, indoctrination, loyalty, initiative, and plans.

The writer's remarks on the indoctrination to be carried on in the active fleet, I take to apply to the personal indoctrination by a commander, that is necessary to place in the subordinate's mind the new point from which to carry out his part of the commander's plan. The subordinate's mind being charged, he goes forth to stand for his senior, giving out to the best of his ability what he has received.

The writer's words on Nelson's tactics—"that they are in the main conspicuously sound"—show a reservation that I think unnecessary. This is followed by reference to the battle of Trafalgar. The tactics of this battle was the concentration on the rear while holding the van and center. The critical part of the battle was the holding of the van and center. The second in command had the fighting part assigned him, but it took Nelson's genius to give Collingwood the chance to carry it out. Nelson's handling of his column as he did, was to my mind, the evidence of the supreme genius of Nelson for a naval action, comparable to Napoleon's genius in selecting the moment for delivering the decisive charge.

Jervis had the various elements that Nelson had, in loyalty, plans, etc., but on the field of battle he made a mistake. At Trafalgar, there was no error of judgment. From my study of the action I do not see how Nelson could have conducted his detachment otherwise, under the conditions of the problem.

To criticize this approach is like criticizing the use of nitroglycerine as a drug because it is a high explosive.

The criticism of the approach in Nelson's attack is due to the failure of the critics to appreciate the attack in its entirety. Collingwood when writing that the plan was carried out, stated what he knew to be the case, but he spoke in a language that others did not grasp.

My remarks on this subject are prompted by the feeling that in criticizing the approach by analyzing the dangers of an end-on attack, we lose sight of the fact that it was but a maneuver to cover the attack on the rear, and to deliver that attack as quickly as possible.

This is only to state the truism that every situation in war differs in details, and in the carrying out of broad plans details will change. Thus to-day we may draw up battle plans for a concentration on the van, rear, center, or flank, but no one could consider it necessary in carrying out such a plan to follow the details of Nelson's attack. Togo's Tsushima may be called an attack on the van and center, and it resembled Aboukir as nearly as modern weapons would permit. To criticize the turn made by Togo is to overlook the broad tactics of the action.

The words of the essay on the necessity for loyalty I accept most cordially, but the stand taken by the writer on "selection up" would, if put into practice, seriously affect this loyalty. It is doubtful if there can be a hearty loyalty between officers that are shifted in seniority after years of service, except when the change has been due to some very abnormal cause.

This tendency has been recognized in the English and German navies. In the former, by not changing an officer's seniority after entering the captain's grade. An officer superseded would feel as Nelson did when he thought Captain Smith was to be given an independent command in his area.

Nelson immediately asked to be relieved and wrote: "I do feel, for I am a man, that it is impossible for me to serve in these seas with the squadron under a junior officer.

"And now finding that much abler officers have arrived within the district which I had thought under my command, etc.'

Nelson, though given a captaincy when very young, under the peculiar conditions of the service, was not advanced over the heads of his seniors after receiving the rank of captain.

The Petty Officer Question

(SEE PAGE 1571, WHOLE NO. 148, VOL. 39, NO. 4, DECEMBER, 1913)

LIEUT. COMMANDER E. C. DE KAY, N. M. N. Y.—Without doubt the most important factor in the operating force of any ship, yard, plant, factory or commercial enterprise is the man who oversees the detailed performance of the work to be carried out, pursuant to the decisions and orders of the

administrative and executive force of the organization. It is, therefore, of paramount importance that those who are to oversee the execution of the plans should be qualified to supervise and direct the work of the men who are placed under their charge for the accomplishment of the desired results.

Lieut. Commander D. W. Knox makes a very potent suggestion in his discussion of this question when he states that "gun crews, boat's crews, hose crews, W. T. doors, parties, etc., should be almost synonymous terms," and it would seem that such a co-ordination of duties, if not already in full effect, would be very easily established by only a slight rearrangement of the ordinary station bill.

The article in the December, 1913, issue of the PROCEEDINGS by Ensign E. W. Robinson, while a bit rough on the discipline and subordination of men holding special ratings, presents a plan which merits consideration, but which seems to be capable of more simple solution along the lines to be presented herewith. The necessity of considering a petty officer as a "person lawfully invested with a subordinate office" needs no additional brief, and the necessity of giving due consideration to the qualities of adaptability and leadership in those who are to be selected for ratings which imply leadership as well as adaptability, is too well accepted to require further argument.

Granting, therefore, that a petty officer should typify and signify authority and experience, it would seem feasible to preclude from general authority those who had not had the experience necessary to qualify them for the performance of the varied duties of execution and leadership expected of those whom we are asked to consider as invested with a subordinate office. The plan devised by those who have given great thought and effort to the co-ordination of ratings, responsibility, position and pay has resulted in the rating of specialists in accordance with the pay necessary to obtain their services, and, by virtue of these ratings, they have been given a position in the personnel of a ship to which their special qualifications entitle them. Their responsibility, however, has unfortunately been co-ordinated along with their pay because of these ratings, and the sentiments expressed by Ensign Robinson undoubtedly prevail in many quarters owing to the deep-seated feeling in the minds of all officers that a petty officer, no matter what his branch or length of service, is, or should be, by reason of his rating *per se*, a leader, in all that the word implies, whereas under present-day conditions he has probably been selected on account of his special qualifications rather than his general knowledge and efficiency.

The suggestion herein submitted takes this view of the situation. It simply proposes retaining the present rating-marks for all petty officers whose duties call upon them to direct the work of various crews, parties or gangs, and who are expected to set an example in deportment, as well as efficiency in their ratings. The increasingly numerous specialists aboard ship to-day are already on a widely varying plane as regards pay, so that the original intent of making the rating commensurate with the remuneration received, has practically outgrown its limitations and should, therefore, come before a "plucking" board for consideration.

If all specialists were deprived of the chevron commonly spoken of as the "buzzard" or "crow" mark, and given a corps device under which could be appended straight horizontal bars indicating the grade, or, have the corps device surrounded by circular bars as in use by the Canal Zone Constabulary, there would be no misleading impression as to the *general* authority of the wearer.

There does not seem to be any necessity of grouping a boilermaker in a grade corresponding to seamen 1st class, any more than it would be suitable to group a chaplain or paymaster with ensigns; the star on the sleeve of the line-officer is deemed sufficient to identify him and distinguish between his duties and that of a "sky pilot," and if the spread eagle were confined to the use of only such petty officers as were entitled thereto by reason of experience, adaptability and leadership, there would be no more question of confusing the position or responsibility of a graded member of the artificer or special branches with those of the seamen branch than in the case of commissioned or warrant officers.

Petty officers of the seamen branch, or as they may be termed, "line petty officers," should be considered as bearing the same relation to their associated specialists as the line commissioned officer bears to his specialty associates. Should such a distinction be instituted it would not be long before the province of petty officers would not only be *defined* and understood by the whole ship, but their province would be *respected* and not *infringed* upon by either their superiors or associates.

If a coppersmith, a baker and a painter are all of the relative grade of petty officer 1st class, give them each three horizontal red or blue bars under a device indicating their occupation, but let us not continue further in our orgy of co-ordination by turning loose upon the beach a fresh-caught bench mechanic or journeyman baker in the make-up of a first-class petty officer of the United States navy.

In such a distinctive rearrangement the authority theoretically assigned to line petty officers would soon be co-extensive with the assigned responsibilities and such authority would not only be supported by seniors but would be jealously developed and protected by all with a resulting increase in morale, upon which is dependent discipline and efficiency.

NAVAL PUBLICATIONS

BOOK REVIEWS AND NOTICES

"Publication of the American Ephemeris and Nautical Almanac for 1916."

The American Ephemeris and Nautical Almanac for the year 1916, recently issued by the U. S. Naval Observatory, differs materially in construction and arrangement from previous numbers of this publication.

The preparation of this volume marks the inauguration of the scheme of cooperation adopted by the congress of representatives of the various national Ephemerides held at Paris in 1911. In accordance with this agreement a portion of the material contained in the volume for 1916, including the greater part of the Greenwich Ephemerides of the moon and planets and the apparent places of the stars, has been supplied by the foreign almanac offices, while the office of the American Ephemeris has in turn furnished to all foreign offices the data regarding eclipses, occultations, physical ephemerides of the sun, moon and planets, etc. This system of exchange reduces considerably the amount of duplication of work by different computers, and will, it is believed, prove mutually beneficial to the offices concerned.

Congress has, however, in the law authorizing this exchange, provided that any such arrangement shall be terminable on one year's notice and that the work of the Nautical Almanac Office during the continuance of any such arrangement shall be conducted so that in case of emergency the entire portion of the work intended for the use of navigators may be computed by the force employed by that office, and without any foreign cooperation whatsoever; and that employes whose services in part can be spared on this account may be employed in improving the tables of the planets, moon and stars, to be used in preparing for publication the annual volumes.

A rearrangement of the material contained in the first part of the Ephemeris has been made, with the view of giving it in better and more convenient form for the astronomer. Instead of giving portions of the ephemerides of the sun and moon alternately, month by month, there is now given for the entire year first the Ephemeris of the sun complete, then the Ephemeris of the moon complete, then the Ephemeris of each of the seven major planets.

Other changes worthy of note are the following: Daily Ephemerides are given for 35 circumpolar stars instead of 25 and they have been arranged in more convenient form. The apparent right ascensions of stars whose declination is less than 60° are given to 0.001 seconds, and the apparent declinations of all stars are given to 0.01 minutes. The data relative to eclipses, occultations, physical Ephemerides, and satellites, are given in Greenwich time instead of Washington time. The style of type adopted permits the publication of much of the material in a more condensed form without loss of legibility.

The preparation of the material for the American Ephemeris and Nautical Almanac for 1917, on the same general lines as the volume for 1916, is now well advanced. J. A. HOOGEWERFF.

"The Law of Naval Warfare." By J. A. Hall. (Chapman and Hall, London, Publishers.)

Mr. Hall, barrister-at-law and lieutenant in the Royal Naval Volunteer Reserve, states in his preface that "This book is written primarily in the hope that it may prove of service to naval officers. The law has been stated as dogmatically and with as little argument as possible; but very full references are given in the notes for anyone who wishes to pursue the subject further."

The author has, in the scope of 165 pages, produced an understandable compilation of naval law, clearing up points knotty to the majority of people. Naval officers seeking ready answers to practical international law questions will find the book adapted to their needs, and any resentment which might be felt at the dogmatic style necessary to attain brevity, is relieved by the copious reference notes and careful indexing.

The clear definitions and the logical arrangement of topic headings and subheadings give the book a coherence and simplicity not usually associated with law treatises written by lawyers. As an example of the author's knack for getting at the nub of a matter, the following may be quoted: "Spies, too, may be employed with perfect propriety, though they themselves, if caught, may be made to pay for it with their life, not as punishment for a crime but as a deterrent from conduct which belligerents regard as particularly dangerous to their interests."

On the other hand, the reader at times may be puzzled by the awkwardness of such passages as the following: "Thus any neutral would be justified in refusing to admit a vessel which, like the Russian *Dmitri Donskoi* in 1904, used, for the totally different purpose of cruising about overhauling neutral shipping, the coal obtained to enable it to reach a specified destination." It would not seem an unjust criticism to say that revision where such involved phrasing occurs would increase the value of Mr. Hall's work as a text book. The limitation may also be pointed out that acts of reprisal such as pacific blockades and other acts of force short of being acts of war, are not discussed.

The historic instances cited are striking and illuminating. The fact that Italy observed the main articles of the still unratified Declaration of London during the recent war with Turkey, will attract attention to this document, the official translation of which is reproduced in the appendix. Mr. Hall, avoids expressing an opinion of this declaration in his book, but as a matter of fact it has his warm approval.

An idea of the contents can be had from the following table: I. Introductory. II. The Outbreak of War. III. The Mutual Rights and Duties of Belligerents. IV. Treatment of Enemy Subjects. V. Rights and Duties of Neutrals. VI. Blockade. VII. Contraband. VIII. Unneutral Service. IX. Enemy Character. X. Visit and Capture. XI. Prize Courts and Prize Proceedings. Appendix.—The Declaration of London. Index of Cases Cited. General Index. C. C. GILL.

"Canada as an Imperial Factor." By Hamar Greenwood, M. P., Collins, London. The Nation's Library. 264 pages.

"Canada and Sea Power." By Christopher West. McClelland and Goodchild, Toronto. 172 pages. Price $1.00 net.

These two volumes are significant to naval officers chiefly as indicating the important position which the questions of naval support and a voice in Imperial affairs now occupy in Canadian politics. The first book is a concise popular treatise, covering rapidly the history of Canada, its resources, trade, political institutions, and relations with the mother country. The second is a perfervid argument against Canadian assistance of any character in Imperial naval defense, leaning heavily on the familiar arguments of Mr. Norman Angell. The book is full of facts and figures, leading to remarkable conclusions; but its value is perhaps sufficiently indicated by the fact that a chapter is devoted to the mistaken naval policies of King Solomon, and that crushing analogies are drawn from the rise and fall of ancient Tyre.

That Mr. West's book by no means represents the general sentiments of the Canadian people is clear from the fact that, as Mr. Greenwood points out, both the Liberal and Conservative parties in Canada have adopted policies of loyal naval support, differing only as to the form which this assistance should take. Under the Liberal administration of Laurier, the beginnings of a strictly "Canadian Navy" were made in 1909. The Conservative government of Mr. Borden in consultation with the British Admiralty has developed a new policy, calling for an appropriation of $3,500,000 towards the construction, in English yards, of three battleships, to become an integral part of the British fleet. Liberal opposition defeated this measure last August in the Senate, owing to the fact that the life tenure of its members left that body with a Liberal majority; and since then nothing has been done.

The Liberals are anxious to force the government to the country on this issue; but Mr. Borden will probably succeed in delaying action and a consequent election for a year or more at least, or until a real or fancied crisis in foreign relations will enable him to raise the cry of "Loyalty to the mother country" with as much success as in the reciprocity campaign of 1911. The question whether England will get the kind of naval support she wishes is likely to depend in any event on whether she can make Canada feel the urgent need for it, and also on the share she is willing to give Canada in the control of Imperial affairs. A. F. WESTCOTT.

CURRENT NAVAL AND PROFESSIONAL PAPERS

UNITED STATES

Journal of the Military Service Institution of the United States, May-June, 1914.—Our Military Resources *vs.* Our Military Power—National Assurance *vs.* National Insurance (Prize Essay), by Capt. H. S. Kerrick, U. S. A.

Journal of the United States Artillery, March-April, 1914.—The Mine Defense of Harbors (Prize Essay), by Capt. P. D. Bunker, U. S. A.; Joint Army and Navy Exercises, by Col. R. P. Davis, U. S. A.

Scientific American.—The Unsinkable Ship, by a naval architect (Jan. 24, 1914); The Guns of Panama, by C. M. Maigne, U. S. A.

ENGLAND

The Edinburgh Review, Jan., 1914.—The New Monroeism, by Walter Alison Phillips.

Fortnightly Review, April, 1914.—The Training of Naval Officers: An Imperial Question, by Admiral Henderson and Dr. H. B. Gray. The Monroe Doctrine and the Latin American Republics, by R. J. Mac Hugh. The Injustice of War on Mexico, by J. Davenport Whelpley.

The Nineteenth Century and After, April, 1914.—Wanted: an Anglo-Saxon Policy, by Major S. L. Murray.

The Contemporary Review, April, 1914.—The Mexican Question, by Thomas Baty, D. C. L., LL. D.

Journal of the Royal United Service Institution, April, 1914.—How can Moral Qualities Best be Developed During the Preparation of the Officer and the Man for the Duties Each will Carry Out in War? (Prize Essay), by Major A. Lawson, Royal Scots Greys.

Journal of the Royal Artillery, April, 1914.—Aeroplane Reconnaissance by Night, by Brig. Gen. F. G. Stone.

The United Service Magazine, April, 1914.—Aircraft in Naval Warfare, by "Gitche Gumee."

The Engineer.—Some Questions Relating to Battleship Design, by T. G. Owens (April 3, and April 10, 1914); Discussion of British Navy Estimates (Mar. 20, 1914).

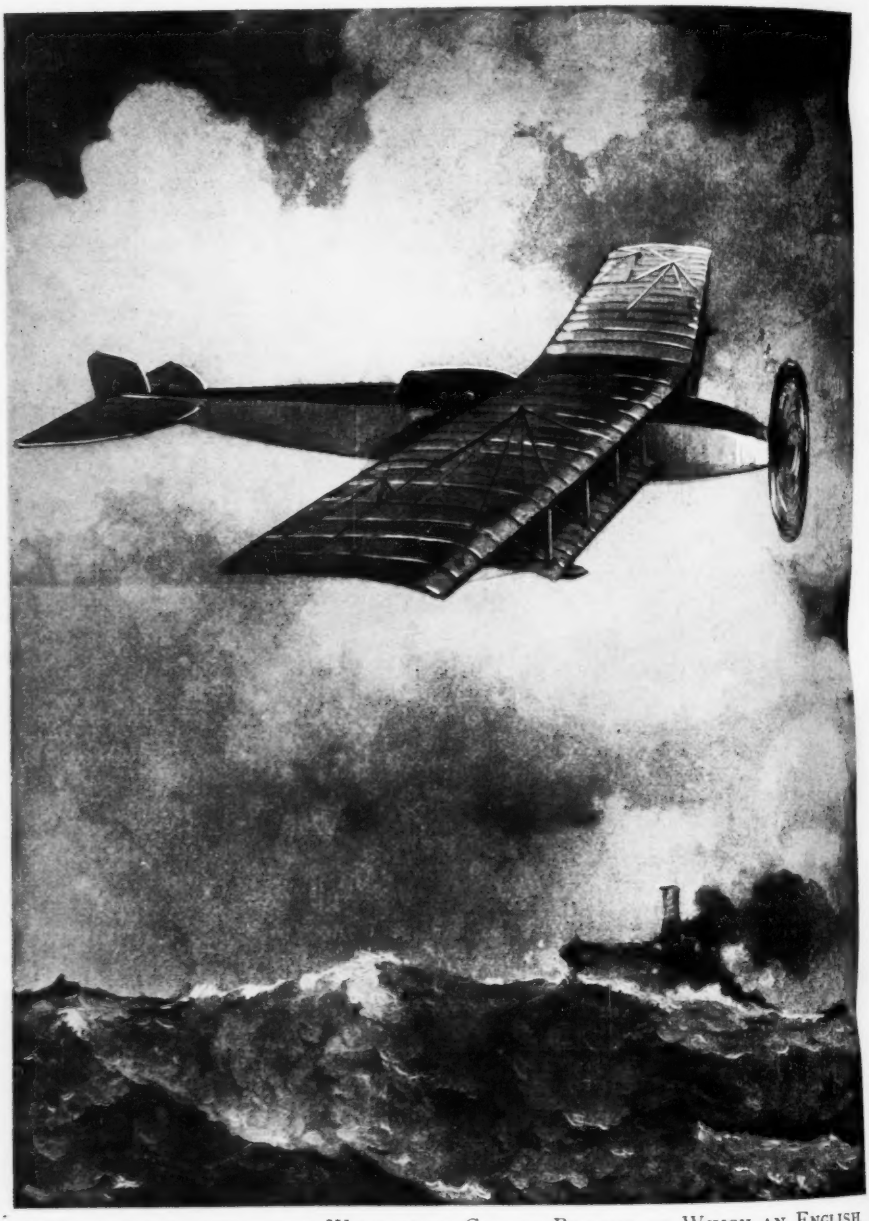
FRANCE

Journal de la Marine Le Yacht.—Reducteurs de Vitesse pour Turbines par Leo Robida (21 Mars and 11 Avril 1914); Les Cuirassés à Tourelles Quadruples (28 Mars 1914); Les Buts d'Escadres, par H. Bernay (4 Avril 1914); Les Torpilleurs d'Escadre (25 Avril 1914).

La Vie Maritimé.—Croiseurs Eclaireurs et Croiseurs de Bataille, par C. Bos (10 Mars 1914); L'Action Britannique dans la Mediterranee par C. Bos (25 Mars 1914).

GERMANY

Marine-Rundschau.—An account of the occurrences at Manila from May to August, 1898 (March, 1914); Der Wiederaufban der Russischen Flotte (April, 1914); Der Torpedoweitschuss (a mathematical study), von Oberlent. Z. S. Andler; Die Strategischen Aufgaben der Japanischen Flotte und Ihr Wirtschaftlicher Rückhalt von Kapitän N. N.



General Appearance of the Wanamaker-Curtiss Biplane, in Which an English and an American Pilot Will Attempt to Cross the Atlantic Ocean Early During the Present Summer.

PROFESSIONAL NOTES

Prepared by LIEUTENANT C. C. GILL, U. S. Navy

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NAVAL POWERS

ARGENTINE REPUBLIC

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Rivadavia.....	27,940	22.5	12 12-in., 12 6-in., 16 4-in.	Fore River Co.	Under trials
Moreno.....	27,940	22.5	same	New York Co.	Launched Sept. 23, 1911

NOTE.—Argentine has four destroyers, displacement 950 tons, contracted for (two built at Nantes and two at Bordeaux), launched in 1911 but not yet turned over to the government. Also four additional destroyers of about 950 tons to replace those sold to Greece, building at Krupp's Germania Works.

AUSTRIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Prinz Eugen..	20,010	20	12 12-in., 12 5.9-in., 18-12 pdr.	Trieste	Trial Mar. and Apr. 1914
Szent Istvan..	20,010	20	same	Fiume	Launched Jan. 17, 1914
Ersatz 'Mon'ch	24,500	22½	10 14-in.	Trieste	To be laid down, 1914
" Budapest	24,500	22½	same	"	" " " " 1914
" Wien....	24,500	22½	same	Fiume	" " " " 1914
" Hapsburg	24,500	22½	same	Trieste	" " " " 1915
Small Cruisers					
Saida.....	3,454	27	9 4.1-in.: 2 6-pdrs.	Montalcone	Trials Apr. 1914
Helgoland	3,454	27	same	Fiume	Launched Nov. 23, 1912
Novara.....	3,454	27	same	"	" Feb. 15, 1913

NOTE.—Three destroyers launched in 1913, displacement 787 tons, nearing completion. Two submarines, displacement 550 tons, and three of 860 tons, contracted for in 1912 are to be built by Krupp Co. There are also 27 torpedo boats of 250 tons displacement in various stages of construction.

FIRST DREADNOUGHT SQUADRON.—The third Austro-Hungarian dreadnought, *Prinz Eugen*, on completing her trials, will join the commissioned squadron, displacing the *Zrinyi*. The first squadron will then consist of three dreadnoughts, while the second, or reserve, squadron will contain the three battleships of the *Erzherzog Franz Ferdinand* class, sometimes called "semi-dreadnoughts," owing to their armament of four 12-inch and eight 9.4-inch guns. The *Prinz Eugen* was laid down at Trieste on January 15, 1912, and has thus been built in about 27 months. The *Viribus Unitis* took only 26 months to complete, and the *Tegetthoff* was commissioned 31 months after her keel was laid. The delay in connection with the fourth ship, *Szent Istvan*, which was laid down in January, 1912, and is not expected to be completed before January, 1915, increases the average building period for these four ships, but as a matter of fact this delay is quite exceptional. Before it undertook the *Szent Istvan* the Danubius yard at Fiume had never built anything larger than torpedo-boats and other small craft, and it

was, therefore, not equipped for dreadnought construction. A new slip had to be made and other improvements effected. As it is it will be a remarkable performance if the *Szent Istvan* is commissioned next January, considering the lack of facilities at the Fiume yard.

The rapid construction of the first dreadnought squadron is an achievement of which the Dual Monarchy may well be proud. That it has not been accomplished at the cost of sound workmanship is evident from the uniformly favorable reports received concerning the *Viribus Unitis* and *Tegetthoff*, both of which have now been in service for some time. As far as shipbuilding and engineering efficiency goes, there is no doubt that, given the financial means, the Austro-Hungarian Navy could be developed at a rate that would quickly give it a commanding position in the Mediterranean.—*Naval and Military Record.*

AUSTRIAN DESTROYERS.—All of the six destroyers of the Austrian *Tatra* class, three of which are commissioned and the other three just undergoing trials, have been remarkably successful. Of 790 tons displacement, they have attained speeds of 32 to 33 knots, and carry an armament of two 4-inch, four 12-pounder, and two 18-inch torpedo tubes. All six vessels have been built at the Danubius Works at Fiume.—*The Engineer.*

SEVEN SPIES SENTENCED.—On March 20 sentence was delivered in the espionage trial in Vienna. One man and the wife of another were acquitted. These, like the rest, have been in prison for 22 months awaiting trial. Dyrtz was condemned to five years' imprisonment with hard labor, Pitschkur to three and three-quarters years, whilst the woman Hoffman, who brought money from Russia, was sentenced to 27 months' hard labor. The other prisoners received sentences varying from four years to 18 months. In all cases the 22 months period of imprisonment awaiting trial is to be deducted. The president of the court laid down a new point, *i. e.*, that it was justifiable to consider the mere crossing of the frontier as an attempt at spying. He was on surer ground when he stated that in 1912 it was of the utmost importance to Austria-Hungary's neighbors to know whether the Dual Empire was prepared for war or otherwise. This had, no doubt, some effect on the nature of the severe sentences inflicted by the court.—*Army and Navy Gazette.*

AUSTRO-HUNGARIAN GRAND MANEUVERS.—These maneuvers will be held this year near the frontier of Russia and of the Balkan States, and will exceed in importance all preceding maneuvers. More than fifty general officers will take part. Contrary to precedent, the scheme of operations this year will not presuppose the co-operation of the Roumanian Army with the Austro-Hungarian troops. The Archduke Francis Ferdinand, who, in the event of war, would be the commander-in-chief of all the armies of the monarchy, will have general direction of this year's grand maneuvers.

ARMY AND NAVY ESTIMATES.—According to *Die Zeit* the Austro-Hungarian Army estimates for 1914-15 will show an increase of 150,000,000 crowns over last year's estimates, 55,000,000 of which will be ordinary and 95,000,000 extraordinary expenditure.

The naval estimates will amount to 76,000,000 crowns, being an increase of 1,000,000. The new shipbuilding will amount to 426,000,000 crowns, spread over a period of five years. The projected four dreadnoughts will have a displacement of 24,000 tons, a length of 172 meters and will carry ten 35-centimeter guns.

AUSTRIA AND THE MEDITERRANEAN.—The Austrian Navy, which has hitherto been seldom seen outside the Adriatic, is to become a high sea force, corresponding in its character to the High Sea fleet of Germany. Arrangements have been made for the first division of the Austro-Hungarian Navy,

which includes the dreadnoughts *Viribus Unitis* and *Tegetthoff*, to leave Austrian waters at the end of this month under the command of Rear Admiral Loffler, on what is described in Austro-Hungary, according to *The Times* Vienna correspondent, as a "politico-commercial cruise in the Eastern Mediterranean." It is expected that the third dreadnought, *Prinz Eugen*, which, it is stated, has just been taken over by the navy, will join the division later. On this cruise, which will last two months, the Austro-Hungarian dreadnoughts will for the first time show themselves in foreign waters. The ports to be visited include Corfu, Malta, Alexandria, Beirut, Smyrna, Mitylene, Salonika, and the Piræus. The significance of this cruise will not be lost upon British naval officers. Germany intends to continue to maintain a squadron in the Mediterranean, and everything points to naval co-operation between this force and the fleets of Austria and Italy. The old idea that Italy and Austria would never co-operate at sea is being submerged in the new and remarkable naval developments which are now taking place in the Mediterranean. We cannot doubt that it is the realization of the importance of this movement which has led the Admiralty to determine to send a British battle-fleet into the Mediterranean at the earliest possible moment.—*Naval and Military Record.*

BRAZIL.

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleship Rio de Janeiro	28,000 to 30,000	..	8 or 10 15-in.	Armstrong, Whitworth & Co.	Contracted for Feb., 1914

NOTE.—Three submarines, contracted for in 1912, to be built at Spezia, displacement 330 tons, were ready Aug. 1, 1913, and two have been turned over to the government.

MONITORS IN THE MARKET.—According to the newspapers, the government has decided to sell the war vessels *Javary, Madeira,* and *Solimoes,* now under construction in England, on account of their unsuitability for river navigation.

The vessels are "armored monitors," and their principal dimensions are: Length, 265 feet; breadth, 49 feet; depth, 8 feet 6 inches; displacement, 1250 tons. They are engined for a design speed of 11½ knots, and a radius of action of 4000 nautical miles. The armament consists of two 6-inch q. f. guns, two 4.7-inch Howitzers, four 4.7-mm. q. f. and six smaller guns.

CHILE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Almirante Latorre	28,000	23	10 14-in., 16 4.7-in.	Armstrong, Whitworth & Co.	Launched Nov. 27, 1913
Almirante Cochrane	28,000	23	same	"	Laid down Jan. 22, 1913

NOTE.—Of the 6 destroyers of 1830 tons, built by J. S. White & Co., two have been delivered. Two submarines of 420 tons displacement have been contracted for to be built by Elec. Boat Co., Seattle. One of these has been launched.

CHINA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Light cruisers					
Fei-Hung	2,600	22½	2 6-in., 4 4-in., 2 3-in., 6 3-pdr.	N. Y. Ship Bldg. Co.	Reported sold to Greece
.....	4,800	27	.....	Monfalcone	Ordered Nov., 1913
.....	1,800	24	.....	"	Contracted for Sept., 1913
.....	1,800	24	.....	"	same
.....	1,800	24	.....	"	same

NOTE.—Four destroyers, displacement 400 tons, are building, one at Trieste and three at Schichau. The three Schichau boats have been delivered.

DENMARK

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Niels Juel.....	3,675	16	2 9.4 in., 4 5.9-in.	Copenhagen	Laid down Sept., 1913

NOTE.—Three destroyers are under construction at Copenhagen and three submarines, displacement 200 tons, are being built by Whitehead Co.

FRANCE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
France.....	23,092	20	12 12-in., 22 5.5-in.	St. Nazaire	Trials April, 1914
Paris.....	23,092	20	same	La Seyne	" Mar. 15, 1914
Bretagne.....	23,172	20	10 13.4-in., 22 5.5-in.	Brest	Launched April 21, 1913
Provence.....	23,172	20	same	Lorient	" April 20, 1913
Lorraine.....	23,600	20	same	St. Nazaire	" Sept. 30, 1913
Languedoc....	24,828	21.5	12 13.4-in., 24 5.5-in.	La Seyne	Laid down April 28, 1913
Normandie....	24,828	21.5	same	St. Nazaire	" July 5, 1913
Flandre.....	24,828	21.5	same	Brest	" Oct. 10, 1913
Gascogne.....	24,828	21.5	same	Lorient	" Oct. 1, 1913
Bearn	24,828	21.5	same	La Seyne	Contract Jan. 7, 1914

NOTE.—There are approximately six destroyers and 23 submarines under construction.

"FRANCE" AND "PARIS."—These two battleships have received their armament and were placed in commission in April for their preliminary trials. Four months or more, however, will elapse before they are ready for active duty with the fleet. They are of similar type to the *Jean Bart* and *Courbet* class, and like them will be completed within three years if they join the fleet before next November. France will then have four dreadnoughts complete, besides the *Dantons*.

NEW SUBMARINES.—No less than six French submarines of 820 tons normal displacement are under construction, the names being as follows: *Joessel, Fulton, Laplace, Lagrange, Regnault* and *Q 114*. Each vessel is of 4000 horse-power, the twin screws being driven by geared turbines when on the surface and by electric motors when submerged. No less than ten torpedo tubes are, it is said, carried in each.—*The Engineer.*

NEW MINISTER OF MARINE.—M. Monis resigned the portfolio on account of the Rochette scandal, and M. Armand Gauthier is now Minister of Marine. M. Gauthier is a distinguished medical man, 64 years of age, and was Minister of Public Works in 1905. M. Monis was Minister of Marine less than four months.

CHANGES IN "FLAG" COMMANDS.—This year will prove somewhat critical from the point of view of the high command, as the Toulon fleet will simultaneously lose its two senior officers, viz., Commander-in-Chief de Lapeyrère, who will shortly arrive at the term of his three-year command, and Admiral Marin-Darbel, chief of the "Deuxième Escadre," who will reach the age limit next June. The change in itself cannot be said to be favorable to the interests of efficiency, and, in the second place, it will not be easy to replace so truly able a leader as Admiral de Lapeyrère, who will transmit to his successor a fleet in splendid condition of training. At the same time, there is no reason to fear that the excellent work accomplished will be undone. The time is no longer when every new Gallic fleet commander had at heart to innovate and experiment. Our admirals are now agreed on all essential points of the war preparation. They all believe, for instance, in the value of efficient gunnery, and of simple and rapid tactical formations as well as in the importance of encouraging initiative in commanders. And then there is the fact that the forthcoming vacancies will be filled by experienced chiefs having proved their aptitude to command in charge of cruiser squadrons or battle divisions.—*Naval and Military Record.*

STRENGTH OF THE FRENCH FLEET.—If there is no change in the French Naval Law, all these remarkable ships should be completed by the autumn of 1917, and France will then possess a navy of considerable power, comprising

4—*Jean-Bart, Courbet, Paris, France,* principal armament, twelve 12-inch guns.

4—*Bretagne, Provence, Lorraine,* ten 13.5-inch guns, and *Bearn,* with twelve 13.3-inch guns.

4—*Gascogne, Flandre, Normandie, Languedoc,* with twelve 13.6-inch guns.

4—*Duquesne, Tourville, Lyon, Lille,* having sixteen 13.5-inch guns.

This will enable two squadrons to be completed with ships of the latest design, and in addition, the French Navy will still possess the six vessels of the *Voltaire* class, reinforced by the five vessels of the *Patrie* type. France will possess at this date a formidable battle fleet, but unfortunately she will at that date have only nine large cruisers and not a single ship of the familiar scout type, and her flotillas are being weakened year by year owing to the obsolescence of existing vessels and the failure to adopt an energetic policy in the construction of new ones. When the friends of France reflect on her long coast line, the extent of her oversea empire and the wealth of her ocean-borne trade, they cannot but regret the failure to provide an adequate number of ships for scouting duties with the battle fleet and for commerce and coastal protection.—*Naval and Military Record.*

A REMARKABLE DESIGN.—The Normandie design has been generally approved by French naval opinion, and the authorities have been encouraged to proceed with the development of a yet more remarkable design. It is intended to lay down one other ship with three quadruple turrets, and then

to complete in the next three years four more vessels of the new design. These ships will have a displacement of 29,500 tons, and will mount not three, but four turrets, thus giving to each ship 16 guns, or exactly twice the number mounted in the British *Queen Elizabeth* class. The gun is to be of a new type. It is still to be called a 34-cm. weapon, equivalent to 13.38 inches, but it is said it will be equal in power to the 15-inch gun, which has been adopted in other countries. It is proposed to mount the turrets so as to give a fire ahead of no fewer than eight guns and to replace electricity by hydraulic power. The French authorities, by the adoption of the quadruple turret, are securing a 16-gun ship while remaining faithful to the 4-turret idea. It is quite certain that our neighbors would not be embarking on the new type of turret without ample experiment. In matters of naval design they have always been cautious and progressive. The 4-gun turret must have satisfied all requirements on trial or they would not be adopting it in these latest ships.—*Naval and Military Record.*

NEWEST DREADNOUGHTS.—*The Daily Telegraph's* Naval Correspondent says: A heavily armored battleship with a speed of 20 knots, which can discharge nearly 20 tons of metal from her guns, all aimed shots, in a single minute, is the latest triumph of French naval designers. Four of these marvelous vessels are about to be laid down in French yards, and it is anticipated will be ready for sea in 1917.

In offensive and defensive qualities they will be the most remarkable ships afloat, and associated with this shattering gunfire will be six tubes for the discharge of 18-inch torpedoes, each carrying an explosive charge of over 200 lbs.

NEW DESIGN FOR BIG SHIP TORPEDO TUBES.—French naval opinion has become of late alive to the possibilities of the new type of torpedo as a battle weapon. Whereas the *Dantons* have only two tubes, the *Barts* and *Bretagnes* received four, and the *Normandies* and *Duquesnes* are to be fitted with six, all of 450 mm. (18 inches), though there is a chance that the last-named ships will be armed with an improved torpedo of larger capacity and longer range, analogous to the British 21-inch, and shortly to be the object of comparative experiments. The substitution is advocated of movable above-water tubes behind thick armor for the fixed under-water tubes now everywhere in use, which would permit the concentration of several tubes on one target, and would considerably improve the chances of hitting. The danger of an innovation of that sort is not denied, but engineering and constructional skill can minimize it, and the enormous advantages it offers are thought well worth running some risks for, safety being best attained through the prompt destruction of the enemy. Considering the primary importance the French Navy now gives to the value of tactics of offence, this interesting idea is likely to assume practical shape at no distant date, though a few critics contend that under-water tubes, judiciously placed and in sufficient number, can be made to answer battle requirements.—*Naval and Military Record.*

FRENCH NAVAL MANEUVERS.—According to *Le Yacht* the French naval maneuvers in the western Mediterranean, May 14-31, are to carry out two problems of concerted action.

In the first problem, a force stationed at Ajaccio learns that an enemy fleet has passed Gibraltar and is advancing to attack one of the four ports of Toulon, Marseilles, Philippeville, or Bizerta. It is the duty of the Ajaccio force to seek out and destroy the enemy. In the second, the enemy force has as base of operations the coast of Algiers. The French forces are at

Bizerta and Ajaccio. Their problem will be to make a junction in the shortest possible time and attack the enemy.

Following these exercises, the fleet will take supplies at Bizerta, and then take part in general maneuvers under the direction of the commander-in-chief. During the return, battle formations will be practiced, and torpedo-boat attacks, followed by various operations along the Provençal coast, such as protection of forces at anchor, torpedo-boat attacks, mines, etc.

FRENCH VIEWS ON ARMOR PROTECTION.—The prospective expansion of the shipbuilding programme has brought to actuality the question of armor protection. Criticism is offered to the decision of the Admiralty to adopt belts of only moderate thickness at a time when the ever-increasing caliber of heavy guns impels England and Germany to much strengthen the protection of the water-line. Within the last eight years the progression has been in France from 10 to 12 inches, whereas the thickness of belts has passed in England from 10 to 13.5 inches, and in Germany from 12 to 15 inches. Even the fine *Normandies* are outclassed, in the matter of armor belts, by the British *Warspites* and the German *Kœnigs* and *Wœrths*. To such reproaches constructional experts answer that the maximum thickness of the belts is no criterion as to the real value of the protection of a given ship, a *Majestic*, for instance, with a relatively thin, but very broad water-line armor, being better protected than a *Carnot*, the 17-inch belt of which is submerged at sea. Not only are the *Barts*, *Bretagnes*, and *Normandies* a great improvement on their predecessors, but their defensive designs embody the data of the Iéna experiments, and, all points considered, well satisfy battle requirements. The fitting amidships of plates of very great thickness, imperviable to the most powerful guns, would entail either a substantial increase in the displacement and cost, a suppression of armor on ends, as in the British and American super-dreadnoughts, or the reduction of its thickness to some 4-inch, as in the ships of the Triple Alliance; all courses not commending themselves to the bulk of French naval men, who prefer more guns rather than additional armor.

POSITIONS OF FRANCE AND ITALY IN THE MEDITERRANEAN.—The announcement of the prospective purchase by the Italian Government of two South American dreadnoughts now completing in English yards is causing some concern in Paris naval circles, and no wonder. An event of that sort would be disastrous for the French Mediterranean situation already none too strong. If the four *Barts* and the six *Dantons* (204,000 tons; 72 guns of 12-inch and 72 of 9.4-inch) can be claimed to be a match for the four Italian *Dante-Cavours* and three Austrian *Viribus* (150,000 tons; 87 weapons of 12-inch) likely to be ready in 1914, supremacy will unquestionably be transferred to the side of the Triple Alliance, once Italy has received ready-made reinforcements of the size and power of the *Rio de Janeiro* and *Latorre*. The arrival in the Mediterranean arena of the former alone, which mounts fourteen 12-inch guns, would be sufficient to place France in a position of distinct inferiority, especially when it is remembered that the dreadnought-cruiser *Goeben* would be added to the Austro-Italian combination in a case of emergency.

It would be, of course, easy for France, which is very much the stronger Power financially, to outbid Italy and make her own situation in the Middle Sea perfectly secure. Such a course, unfortunately, French political institutions render impracticable, and there is little hope of Gallic financial action exercising itself through the medium of a friendly Power in need of a ready-made fleet. To the expected sudden increase of the Italian fleet the French retort will, it is understood, be on the following lines: Firstly, the 23,600 *Bretagne* and *Provence*, copies of the British *Orion* and individually

superior to a *Rio de Janeiro*, will be pressed forward and be got ready for sea by next autumn, which can be managed easily by having recourse to overtime work; secondly, the 29,700-ton *Duquesne, Tourville, Lyon*, and *Lille* will be ordered at an earlier date than is now arranged; and, thirdly, a substantial supplementary programme will be submitted to the approval of Parliament, with a view to asserting beyond contest the supremacy of France in the Mediterranean, which public opinion is agreed must be maintained whatever the cost. So, in the end, the French Navy, the expansion of which is strictly regulated by Mediterranean developments, would rather gain than otherwise by the Italian move.—*Naval and Military Record.*

BATTLE TRAINING IN FRENCH FLEET.—The prospects of a temporary ballistic superiority on the Austro-Italian side French officers view without exaggerated apprehension, as they are confident of having the advantage in the matter of battle efficiency, which tells more in action than all statistics as to matériel. That there is good ground for an optimistic contention of that sort no one will deny who is acquainted on one side with the economical mode of training prevailing in the antagonistic fleets of Italy and Austria, and on the other with the constant sea practice on British lines with the frequent battle practices with full charges and extensive strategic and tactical maneuvers which have been the life of the Toulon "armée navale" ever since 1911, when the strong man of action—Admiral de Lapeyrère—united under his command the whole of our efficient battleships, fully manned, with the will to spare no effort and no expense to give his country a real sea force, thoroughly familiarized with the realistic aspects of warfare, and equal to whatever responsibilities might confront it. This ambitious programme, for a good part realized to judge from the fine performances of the admiral's gunners and of the zeal and discipline of his crews, is being pursued with unabating vigor, hard work and strenuous research after progress being felt to be the price of true efficiency. In this respect, the present year promises to be an improvement on the last. Towed targets, copied from those in use in the British service, will be substituted for rocks and target-ships, and test the merit of our gunnery staffs under conditions approximating to those of war, whilst from May 14 to June 1 will take place naval maneuvers of unusual interest, intended to be a mobilization test of the whole of the resources available in the Mediterranean. Toulon, Bizerta, Corsica, and the Algerian harbors will serve as headquarters or points d'appui for the various fleets and flotillas, which will include 17 battleships (2 *Barts*, 6 *Dantons*, 5 *Patries*, 4 *Suffren-Gaulois*), 7 cruisers (6 *Quinet-Gambettas* and the *Jurien de la Gravière*), 40 destroyers and 16 submersibles of 550 tons, besides the seaplane mother ship *Foudre*, and the 80 small torpedo-boats and submarines of the Toulon and Bizerta stations. The commander-in-chief, in the flagship *Courbet*, will act as umpire, a series of actions by day and night being planned between two contending forces of equal numerical strength, under the command of rear admirals and captains in succession.

A similar mobilization test is to take place later in the Channel. Rear Admiral Rouyer will have for the occasion under his orders eight small armored cruisers (partly manned with reservists), 24 destroyers, 20 submarines of 400 tons and above, besides the numerous defence flotillas of Cherbourg, Dunkirk, and Brest (nearly 100 torpedo craft on paper). The pursuit, torpedoing and sinking of an enemy attempting to force a passage through the Straits will, as usual, be the main theme of action.—*Naval and Military Record.*

NAVAL EXPANSION.—The cause of naval expansion is being, for the first time, strongly upheld in the course of the electoral campaign, showing that the humiliating lesson of the Agadyr and Carthage-Manouba incidents has

not been forgotten. The majority of candidates have declared themselves in favor of an adequate navy, whilst an effective propaganda is being carried out by the Ligue Maritime by means of lectures and illustrated posters. Electors are made to see, in a concrete and convincing manner, the dangerous inferiority of the French fleet when compared with her German rival, and an urgent appeal is addressed to their patriotism and energy to give the country "une flotte capable d'assurer, en toutes circonstances, notre sécurité et la défense de nos interêts essentials." This appeal has every chance to be heard. Whilst agreed as to the vital importance of supremacy in the Mediterranean, French naval men, supported in the matter by the bulk of public opinion, are at one in considering that their fleet will never be really worth its cost, so long as it is not in a position to compete, on an equal footing, with the sea forces of the Fatherland.

FRANCE AND GERMANY.—We have all learned from the press that Germany is spending many millions on the increase of her army, and that France has been obliged to follow suit. But it requires a great deal of special knowledge, and a careful analysis of figures, to arrive at the practical effect of this expenditure. The report of the French Parliamentary Committee on the Army Estimates now before the chamber gives a lucid summary of the question as it now stands.

The effect of the increased German expenditure has been not only to increase the German Army, but to increase the peace strength of the troops in the first fighting line, so that they can take the field simultaneously with the declaration of war. The Germans have now six army corps on the French frontier, practically at war strength. Until the French passed the law increasing the color service from two to three years, they could oppose to these only three corps, which were, moreover, only at about two-thirds of their war strength, so that on the outbreak of hostilities the French would have had to submit to an invasion in the first instance, and then to fight a defensive campaign in their own territory. Thanks to the efforts made in France, there are now five French army corps on the frontier, and their strength has been increased to an average of 218 men per company of 250, or about eleven-twelfths of their war establishment. The three-years law has added 180,000 men to the French Army, and of these 97,000 have been sent to the frontier.

The total peace strength of the German Army is still considerably higher than that of France, for the Germans have 876,000 men as against 748,000, including 48,000 in Algeria and Tunis. But this is a question of population, and no increase in the estimates can add to the annual contingent of men. According to the Report on the Estimates, much remains to be done. It is proposed, in the first place, to foster the *Sociétés de Préparation Militaire*, which correspond to our Boy Scouts, in order to teach the recruits part of their work before they join the colors; to develop the garrison drill grounds, the ranges, and the maneuver grounds; and to provide additional ammunition for musketry and artillery practice. Whereas the Germans annually spend £2,720,000 on ammunition, the French have hitherto spent only £1,120,000. It will further be necessary to spend large sums on fortifications, in order to render the five French army corps on the frontier a match for the six German corps opposed to them, and further large sums upon telegraphic and telephonic means of communication, in which the army is now deficient. The reduction of the age limits for officers will also entail considerable expense. After briefly referring to the air service, the report concludes: "The effort which we are making towards the maintenance of peace will give us the troops which the existing state of Europe obliges us to keep under arms. But this effort would be futile if we did not, at the same time, take in hand the question of improving the supply of the officers, upon whom will fall the all-important duty of leading our troops in the war upon which the fate of our country will certainly depend."—*Army and Navy Gazette.*

GERMANY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Grosser Kurfürst	26,575	23	10 12-in., 14 5.9-in., 12 3.4 in.	Hamburg	Launched May 5, 1913
Markgraf	26,575	23	same	Bremen	" June 4, 1913
König	26,575	23	same	Wilhelmshaven	" Mar. 1, 1913
Kronprinz	26,575	23	same	Germania	Launched Feb. 21, 1914
Ersatz Worth	29,000	....	8 15-in., 16 5.9-in.	Kiel	Laid down Sept., 1913
"T" 1913	29,000	....	same	"	Laid down May, 1913
Ersatz Friedrich III	30,000	....	8 15-in., 18 5.9 in.	....	To be laid down summer 1914
Cruisers of the Line					
Lützow	28,000	28.5	8 12-in., 14 6-in.	Dantzig	Launched Nov. 29, 1913
Derfflinger	26,500	28.5	same	Hamburg (Blohm & Voss)	Launched July 1, 1913
Ersatz Hertha	28,000	28.5	8 12-in.	Wilhelmshaven	Laid down July, 1913
Ersatz Victoria Louise	....	....	....	....	To be laid down summer 1914
Protected Cruisers					
Karlsruhe	4,900	28	12 4.1-in., 2 t. t.	Germania	Commissioned
Rostock	4,900	28	same	Howaldt	Commissioned
Regensburg	4,900	27.5	12 4.1-in.	Bremen	Launched Apr. 25, 1914
Graudenz	4,900	27.5	12 14.1-in.	Kiel	Launched Oct. 25, 1913
Ersatz Hela	5,500	27.5	10 6-in.	"	Laid down fall 1913
Ersatz Gefion	5,500	27.5	same	Stettin	" "
Ersatz Niobe	....	....	....	....	To be laid down summer 1914
Ersatz Gazelle	....	....	....	....	same

NOTE.—Germany has twelve destroyers and twelve or more submarines under construction. Tonnage of ships building uncertain.

It is safe to assume that the battleship to be laid down this year will be of the same general type as the *Ersatz Wörth* and "*T*" of the 1913 programme, and will therefore have an armament of eight 15-inch and sixteen 6-inch guns. Although the armament of these ships has been made public, nothing is known as to their displacement or speed. Were it not that German battleship design hitherto has been singularly free from surprises, the vessels in question might prove to resemble the *Queen Elizabeth*, not merely in armament, but also in speed. This is highly improbable, however. Any increase in displacement, apart from that involved by the heavier guns, may be safely set down to thicker armor. The 14-inch belt of the *Kaiser* class shows that Germany attaches more importance to protection than to speed where battleships are concerned.—*Naval and Military Record.*

KAISER'S YACHT TO BE LIKE A CRUISER.—Details of the new yacht *Hohenzollern II*, which is being built for the Kaiser, have just been published. She will be of 7300 tons, compared with the 4250 tons of the Emperor's present yacht *Hohenzollern*, and will have a crew of 455 men. The present yacht has a crew of 348.

The new yacht will have a steaming radius twice as large as the present yacht, and a maximum speed of 30 knots. Other features will be turbines, submarine signalling apparatus, a double keel the entire length of the boat and many water-tight compartments which, it is contended, will make her practically unsinkable. She will have armor similar to that on the armored

cruisers, and although she will carry only saluting guns, others can be mounted.

The *Hohenzollern II* will be fitted and illuminated like the most luxurious liner.—*N. Y. Sun.*

DESTROYER CONSTRUCTION.—*The Marine Rundschau* reports the launch at Stettin on January 29 of destroyer *V 25*, one of the 12 boats authorized in the 1913 programme. Six of these were awarded to Schichau and six to the Vulcan Co. As German destroyers are usually launched in an advanced state and are ready for service about four months after going afloat, the first of the 1913 boats will be commissioned before the beginning of this summer, and all are certain to be available by early autumn. They will constitute the Eighth Destroyer flotilla, to be created by October next and stationed in the North Sea. The remarkable promptitude with which the destroyer programme every year is carried into effect deserves to be noted. This is due partly to rapid construction and partly to the practice of commencing the boats almost immediately the contract has been placed. The result is that as a rule German destroyers are commissioned nearly 12 months before the British destroyers that were authorized at the same time. It is said that the Schichau firm could, if necessary, build and completely equip half a dozen destroyers in as many months, and that the other two firms, Germania and Vulkan, which also specialize in this form of construction, would be almost equal to the same performance. If Britain still leads in rapidity of building, where big armored ships are concerned, it is practically certain that German firms hold the record for destroyer construction. The difference may be accounted for to some extent by the greater size of the British boats, which are 1000 tons or more, whereas the latest German destroyers do not exceed 650 tons.

Destroyers *V 26 and S 32*, both belonging to the 1913 programme, have been launched, the former on February 21, the latter on February 28 It is obvious that very little time is lost between the passing of the Navy Estimates and the commencement of the boats authorized therein.

TORPEDO-BOATS IN COLLISION.—During night maneuvers off Heligoland, torpedo-boat *193* was rammed by torpedo-boat *108*. The former was holed in four places, one of the rents being immediately above the water-line. She is being docked at Kiel. The crew was uninjured. Torpedo-boat *54* was seriously damaged by colision with a steamer in Cuxhaven Harbor. *Naval and Military Record.*

"G 171" ABANDONED.—After nearly 18 months work, it is now reported that salvage operations on destroyer *G 171* are to be abandoned. This boat was sunk in collision with a battleship near Heligoland on September 14, 1912. Part of the equipment, including searchlights and most of the torpedo tubes, have been recovered, but the boat itself cannot be raised. There are now six German torpedo craft at the bottom of the sea, the previous unsalved boats being the *S 12, S 26, S 41, S 48* and *S 32*.

SUBMARINE TRAINING.—From all accounts German submarine training is of the same thorough and practical character which has brought the torpedo service to its undoubted high standard of efficiency. The personnel of the new branch has been largely increased, and the additional officers and men, having undergone instruction in the earlier *U* boats, which are used mainly for training purposes, will be available for the new boats now approaching completion. It is the constant aim of the authorities to make ample and timely manning provision for new vessels, and the fact that there are at the present moment many more officers and men undergoing training than will be required for all the boats likely to be ready by the end of the year, shows

that submarine development here will not be retarded by any shortage of personnel.

THE EMPEROR WITH THE NAVY.—According to the *Marine Rundschau* for April the Emperor spent the first days of March at Wilhelmshaven, where he witnessed the swearing in of naval recruits and made several inspections of ships and of the dock yard. His Majesty took up his quarters in the battleship *Deutschland,* and had planned a visit to Heligoland, but the rough weather made a landing there too difficult.

FLEET EXERCISES.—The first combined exercises of the year began in March, when the second battle squadron left Kiel for the North Sea to join the ships of the Wilhelmshaven fleet, including the first squadron and the scouting cruisers. It is not stated whether the third squadron took part in these exercises, which lasted a fortnight. To a certain extent this concentration of the fleet at the end of March each year for the purpose of carrying out exercises is really a period of maneuvers. It is repeated later in the spring, and again in summer, when the entire active fleet exercises in Scandinavian waters. Autumn brings the grand maneuvers, which last from 10 to 14 days. Four times a year, therefore, all the commissioned ships are brought together for exercises, and in a sense the German Navy holds maneuvers every quarter. It is claimed that German flag officers enjoy many more opportunities of handling fleets than fall to British admirals, and it is further contended that these frequent combined exercises add immeasurably to the efficiency and preparedness of the high sea fleet, in personnel and matériel. What does, in fact, seem probable is that the German Navy now gets more training at sea than any other fleet, and is consequently always at a high pitch of proficiency, save perhaps during the winter months, when a large percentage of the men are new to their work.

In connection with the spring exercises the usual practice cruise of the training squadron is now in progress. On March 29 the cruiser *Friedrich Karl,* flagship of Rear Admiral Eckermann, Inspector of Torpedo Training, was joined at Kiel by the *Württemberg* and *Madgeburg,* both of which are attached to the torpedo school; the gunnery ships, *Augsburg* and *Danzig;* the *Wittelsbach,* nucleus ship of the Baltic reserve; the *Hamburg,* escort ship for submarines; and the *Köln,* on board of which is the second-in-command of the cruiser squadron. There were also assembled five torpedo flotillas, numbering 55 boats in all, including the new Schichau boats of the 1912 programme. The whole of the above force put to sea on the same day, and will engage in various exercises, such as gunnery, torpedo running, and steaming maneuvers, until the end of April. This annual cruise is of special importance in view of the fact that the majority of the men taking part only joined the service last October, this being the first occasion on which they go to sea for divisional training. It may well be supposed that this month at sea is a period of arduous labor and strain for the officers in charge.—*Naval and Military Record.*

GERMAN NAVY LEAGUE.—The German Navy League has just published its report for 1913, showing a considerably increased membership and the usual record of activity in spreading naval progaganda. The following figures reveal the position of the league at the close of 1912 and 1913, respectively:

	December 31, 1912	December 31, 191
Main branches	53	53
District branches	3,734	3,845
Representatives	3,212	3,235
Members	320,464	333,574
Associate members	791,445	790,054
Total membership	1,111,909	1,123,628

The funds at the disposal of the league on January 1, 1914, amounted to £20,122. It has also a large sum in hand to be devoted to the building of a home for aged and invalid seamen, an admirable project which has done much to win the support of those who do not view the league's political activity with entire approval. *Die Flotte*, the monthly magazine of the league, now enjoys a circulation of 370,000, while there is a steady output of "communications" to the press, embracing almost every subject connected with naval policy, the work of a very able staff of writers. Oddly enough, these communications often appear in newspapers as leading articles, which shows the extraordinary control the league has gained over the national press. Last year the lantern and cinematograph lectures were on a more numerous scale than in earlier years, while no fewer than 35 special excursions were arranged to the dock yards, 10 of them being for school pupils. In all some 6000 persons were taken to the coast in this way. There is no doubt that under the presidency of Grand Admiral von Koester, who is deservedly popular with all classes, the league has regained much of the prestige and influence which it lost by its unbridled Anglophobia a few years ago. The intimate relations it maintains with the Navy Department were again brought to light in the recent discussion in the Reichstag on the Navy Estimates, when the Secretary of State, in explaining the need for more cruisers, repeated practically word for word the arguments that have all along been employed by the league in its campaign for a new cruiser programme. Thanks to this harmonious partnership the country has been well prepared for the fresh shipbuilding demands which are now anticipated at no distant date.

THE MODERN GERMAN NAVY.—In considering this inevitable rivalry of Germany and England, and trying to understand the German point of view, we cannot fail to perceive directions in which a great nation's sensibilities are historically wounded, so to speak. Germany has won great renown on the battlefield. Her army is thought to be invincible. It has been born out of blood and fire. But this is not the happy fortune of the German Navy. It has never fired a hostile shot. It has not a single tradition of glorious victory to live upon. It is true, as Messrs. Hurd and Castle put before us in their book what few of us never knew before, that there was a German fleet in the days of the Hanseatic League, but it never stood to Germany as the British Navy stands for Great Britain and the Empire, and it never did things as our navy has always been doing. In the course of time it disappeared so completely from the seas that there cannot be many Germans who ever knew of its existence. The Kaiser, we may be sure, has the memory of it always in his mind while strenuously working to make Germany great upon the seas. Nevertheless, the modern German Navy, powerful though it is, has not grown up out of fierce fighting. It is simply the manufactured weapon of war, which has yet to be submitted to the supreme test of naval warfare. This is a very sore point with the Germans, who have built themselves a magnificent fleet, second only to our own. Throughout Germany there is no statue of any kind commemorating a great sea fight or hero sailor. The German goes back to his country after a visit to England, where he sees in Westminster Abbey and St. Paul's, and elsewhere, monuments commemorating the great sea triumphs of England and the invincible genius of her sailors for ocean fighting, with a keen sense of regret that so great a country as his own has nothing of a like nature to show, more particularly as his Kaiser has publicly declared "our future lies upon the seas." And undoubtedly it is to the future that Germany is looking for her naval laurels. As yet she has no battle of the Nile or Trafalgar to justify her claim to world-wide sea power, and to testify to the warlike genius of her sailors. But in the ultimate development of the German Empire there will no doubt be plenty of fighting; for we may be sure that the ambitious men who control its destinies have a clearly-drawn-up map of the world as it is to be when the process of building the Empire is completed.—*Naval and Military Record.*

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Benbow	25,000	22	10 13.5-in., 16 6-in.	Beardmore	Launched Nov. 12, 1913
Emperor of India	25,000	22	same	Vickers	" Nov. 27, 1913
Iron Duke	28,000	22	same	Portsmouth	Commissioned Mar., 1914
Marlborough	25,000	22	same	Devonport	Trials Mar. 1914
Qu'n Eliz'b'h	27,500	25	8 15-in., 16 6-in.	Portsmouth	Launched Oct. 16, 1913
Warspite	27,500	25	same	Devonport	" Nov. 26, 1913
Valiant	27,500	25	same	Fairfield	" Dec., 1913
Malaya	27,500	25	same	Walker	Laid down Oct. 20, 1913
Barham	27,500	25	same	Brown & Co.	Launched Feb., 1914
Roy'l Sover'gn	25,500	21	same	Portsmouth	Laid down, Jan. 15, 1914
Royal Oak	25,500	21	same	Devonport	" Jan. 15, 1914
Resolution	25,500	21	same	Palmer	" Nov. 28, 1913
Ramillies	25,500	21	same	Beardmore	" Nov. 12, 1913
Revenge	25,500	21	same	Vickers	" Jan., 1914
Battle Cruisers					
Tiger	30,000	30	8 13.5-in., 12 6-in.	Brown & Co.	Launched Dec. 15, 1913
Light Cruisers					
Brisbane	5,400	25	9 6-in., 4 3-pdrs.	Sydney	Laid down Jan. 25, 1913
Birmingham	5,440	25.5	same	Elswick	Commissioned, Feb. 3, 1914
Lowestoft	5,440	25.5	same	Chatham	" Apr. 21, 1914
Nottingham	5,440	25.5	same	Pembroke	" Apr. 3, 1914
Aurora	3,600	30	2 6-in., 8 4-in.	Devonport	Launched Sept. 30, 1913
Arethusa	3,600	30	same	Chatham	" Oct. 25, 1913
Penelope	3,600	30	same	Barrow	Laid down Feb. 1, 1913
Phaeton	3,600	30	same	"	" March 12, 1913
Royalist	3,600	30	same	Dalmuir	" June 3, 1913
Galatea	3,600	30	same	"	" Jan. 9, 1913
Inconstant	3,600	30	same	"	" April 3, 1913
Undaunted	3,600	30	same	Govan	Launched April 28, 1914
Cleopatra	4,400	30	.....	Devonport	Laid down Feb. 26, 1914
Calliope	4,400	30	.....	Chatham	" Jan. 1, 1914
Conquest	4,400	30	.....	"	" Feb. 28, 1914
Cordelia	4,400	30	.....	Pembroke	Launched Feb. 23, 1914
Carysfort	4,400	30	.....	"	Laid down Feb. 25, 1914
Comus	4,400	30	.....	Wallsend	" Nov. 3, 1913
Caroline	4,400	30	.....	Birkenhead	" Jan. 28, 1914
Champion	4,400	30	.....	Hebburn	" Feb. 28, 1914

NOTE.—England has approximately 31 destroyers and 24 submarines under construction.

At Portsmouth on March 16, Admiral Callaghan, Commander-in-Chief of the Home Fleet, hoisted his flag on the *Iron Duke*. The new battleship thus becomes the senior flagship of the sea-going fleets. She carries about 1100 officers and men, the largest number on any warship, and she is the best equipped battleship on the sea to-day. Nearly £100,000 worth of ammunition for the big guns is said to have been placed in the ship's magazine.—*The Engineer.*

NEW BATTLESHIPS.—Three of the four new battleships will be in principle *Royal Sovereigns*, completing, with the five now under construction another homogeneous squadron of eight vessels. The fourth battleship will be a faster vessel of the *Queen Elizabeth* type, and will burn oil only. All will be armed with 15-inch guns and a heavy and numerous anti-torpedo-boat armament, and the new anti-aircraft weapons will be carried in all of them. They involve no striking departure from the conclusions reached two years ago, and no new steps towards the gigantic. Two of the four will be begun at the earliest possible moment, so as to be ready in the

third quarter of 1916. Orders to this effect will be given as soon as the House has approved the estimates, tenders being ready, and the money, about half a million, included in the estimates.

FIRST BATTLE-CRUISER SQUADRON.—A correspondent of the *Daily Mail* writes as follows in regard to the new routine which is being tried on board the battle-cruiser *Queen Mary:*

The principle is to trust the men. Captain W. R. Hall, the gunnery expert, who is the captain, has been entrusted by the Admiralty with the delicate task of introducing the changes. The commander is Commander W. M. James, who takes an important part in making the new system run smoothly: (1) Instead of only two watches, the crew are divided into three—Red, White and Blue watches. This enables certain routine duties to be more speedily done and gives greater flexibility to the ship's organization. (2) The crew are given a longer breakfast hour. (3) They have greater freedom of movement. (4) In leave the principle of trusting the sailor is very fully applied. Men belonging to the watches on duty are allowed to go ashore and return as they please during the hours leave is given. Each watch has what is termed a "leave board." The boards for the watches at liberty are opened, and every man who goes ashore puts a peg into a hole bearing his number. When he returns to the ship he pulls the peg out again. When the *Queen Mary* is lying alongside a dockyard jetty the liberty men go ashore as most convenient to themselves, but when she is out at an anchorage both officers and men are obliged to time their comings and goings by the service of boats. The custom in other ships is for liberty men to fall in and be inspected before going ashore. (5) Sunday work has been reduced to a minimum. It is practically finished in the early morning. The men then have the remainder of the day to themselves. Even attendance at church is not compulsory, though, to Jack's credit be it said, this makes little difference to the size of the congregation. Once a month two services are held at the same time. One is conducted by the captain in the quarter-deck; the other is a communion service conducted by the Rev. W. B. Masefield, the chaplain in the permanent church, which is a unique feature of the *Queen Mary's* equipment. (6) This permanent church is open at all times for the use of the men. (7) The *Queen Mary* also carries a cinematograph. (8) There are no naval police. Discipline is maintained by the crew themselves. Police duties are done by petty officers. For the seamen there is a chief petty officer, termed the master seaman, who has several petty officers under him. Similarly, for the stokers, there is a master stoker with his staff of petty officers. In each case these act as boatswain's mates as well as carry out disciplinary duties.

So well has the system answered that the Admiralty are applying it to other ships.

BRITAIN ABANDONS WAR SHIP POLICE.—The *Herald's* naval correspondent writes:

The new system of disciplinary organization in the British Navy, which was introduced experimentally on board the battle-cruiser *Queen Mary* six months ago, has proved so satisfactory that it is being extended to the rest of the fleet. It will take effect as each vessel becomes due to recommission. Thus in less than two years from now it will have become general throughout the whole navy. It would have been the cause of much inconvenience to have attempted the establishment of the new system throughout the fleet at once, and the method of introducing it gradually has manifest advantages.

An important part of the new system is the abolition of a separate body of vessel's police. Discipline is maintained by the crew themselves without the assistance of an outside body, and the duties hitherto performed by the master-at-arms and his corporals are discharged instead by petty officers. The reason for this change is not to be found in any dissatisfaction with the police branch, but is entirely due to the changed conditions of the service and the improvement in the intelligence and education of the bluejackets.

In course of time the police ratings, not being fully employed in preserving order and enforcing discipline, began to assume other functions, mostly of a clerical nature, but totally different from the work they were nominally supposed to perform. This extra staff work can just as well be done by petty officers now that the police have outlived their usefulness.

There are other innovations aboard the *Queen Mary*, the *Argyll*, the *Vanguard* and the vessels to which the new system has so far been extended. Hitherto the crews of British warships have been divided into two watches —the port watch and the starboard watch. Under the new arrangement aboard the *Queen Mary*, they are divided into three watches—the red, white, and blue. This is a more flexible system for organizing purposes, and is said also to have advanced fighting efficiency.

Then there is a "leave board," with a peg for each man, the use of which has superseded the old system of mustering the liberty men for inspection before they leave and when they return to the vessel. Each man to whom leave is given may now go ashore as most convenient to himself so far, of course, as means of transit permit. He puts his peg into the leave board on doing so, and on coming aboard again he takes it out. Thus at any moment those in command may know what men are away from the vessel.

Sunday routine has been considerably modified, the cleaning work being reduced to a minimum so that men may have a larger part of the day to themselves. On board the *Queen Mary* it has been possible to provide a permanent church, and therefore it is unnecessary to "rig church" and "unrig church" as hitherto. This church is open at all times for use by the ship's company, who have also a cinematograph provided for them.

While this new organization is being gradually brought into effect in the fleet, modifications of routine are also being tried aboard various other vessels. On March 1 there was adopted in the home fleets, to be tried for a period of three months, a new arrangement for morning routine by which a longer breakfast time is allowed to the men. This is all part of the policy of the Admiralty for improving the conditions of service on the lower deck on the principle of trusting the men. This is very necessary in the British and American navies, with their voluntarily enlisted personnel.—*N. Y. Herald.*

An alarming mishap befell submarine *C 2* off Harwich on April 2d. The vessel had successfully gone through the exercise of attacking the Sunk Lightship, and on rising to the surface her commander, Lieutenant Herbert W. Shove, found that he was immediately beneath the parent ship, the *Hebe*. He attempted to maneuver between the *Hebe* and the *Fairy*, but the propeller of the *Hebe* caught the submarine, tearing away the periscope and part of the conning-tower. The impact threw every man of the crew of 14 on to the deck, and nearly all received bruises and abrasions. Only the coolness of the officers and all the men under them averted serious consequences.—*United Service Gazette.*

VALUE OF SPEEDY FLOTILLA LEADERS AS PROVED IN THE BRITISH NAVY.—In the statement of work done by the Admiralty last year, which accompanies the new navy estimates, it is rather surprising to find that the authorities are repeating the design of the special destroyer *Swift*. At any rate, they have begun the construction of two vessels which would appear to be similar to her, and which are to be used for the duty on which she is at present employed, that of leading craft in a destroyer flotilla. There were originally 16 destroyers in last year's programme, but only 13 were ordered, and in place of the other three these two large destroyers of a special type have been ordered.

It would certainly appear that the trial of the existing scout cruisers as leaders of the destroyer flotillas has failed. During the last maneuvers the flotillas were worked without cruisers, and as a result of the test and of previous experience there is the demand for large destroyers as leaders. The *Swift* is the only vessel of the kind yet completed, and in order that

she might become leader of the fourth flotilla, in which the newest vessels are serving, she was withdrawn from service as despatch vessel to the commander-in-chief.

The use of scout-cruisers, whether the 2800-ton *Sentinel* class or the 3350-ton *Boadicea* class, both of which were designed for 25 knots, seems to have been unsuccessful because they did not come up to the requirements of the service in regard to the combination of adequate speed and gun power. It is true they have nine or ten 4-inch guns, while destroyers—except in the case of the Chilian boats—have not more than four, but as compared with their 25 knots, destroyers are capable of steaming at from 27 to 34 knots. Consequently, the destroyers outpaced their leaders at full speed.

The idea of working the flotillas without parent cruisers, although adopted for the maneuvers, could hardly become permanent, for there must be vessels to accommodate the commanders of the flotillas and their staffs. Her high speed of 35 knots and displacement of 2170 tons makes the *Swift*, which was built as an experiment about six years ago, well suited for duty as a flotilla leader. Mr Churchill himself seems to have had a share in the recognition of this, for soon after he became First Lord he made many trips in her, and until he became so attracted by the flying corps the *Swift* was his pet idea.

There are, of course, other valuable functions served by the *Swift* and craft of her capabilities. For intelligence work it is a great advantage at times to have a vessel which can steam 100 miles in three hours. There are occasions when it may be necessary to supplement wireless as a means of communication, for while it is well known that the lower powered stations in England are frequently sending messages over long distances there are sometimes many hours when atmospheric interruption or something of the kind occurs and prevents them doing so, especially in the early autumn.—*N. Y. Herald.*

OFFICERS AND MEN.—The Admiralty has secured, or is about to secure, an increase of 5000 in the personnel. This is less by over a thousand than the increase which is being made in Germany, but the addition is nevertheless better than was anticipated, and throughout the navy full credit will be given to the board for this action. If necessary it is always possible, though costly, to retain obsolescent ships in the first line, and thus supply in a measure any deficiency due to inadequate and fully-efficient matériel. But there is no machinery which can make good in a crisis inadequate votes of officers and men. It will never be known by what measures this accession of strength was obtained, but the navy will feel that, if cuts in the estimates had to be made for political reasons, the board did well to insist upon its demand for 5000 more men.—*Naval and Military Record.*

THE ENTRY OF CADETS.—On February 23 there was published an official booklet, entitled, "The Entry and Training of Naval Cadets, prepared by the Director of Naval Education under the Authority of the Lords Commissioners of the Admiralty." It has been issued for the information of parents who think of the Royal Navy as a career for their sons, and of the boys themselves, and its purpose is to tell what has to be done by candidates for Naval Cadetships, how the selection of candidates is carried out, and how the education of the cadet proceeds. Some idea of the intention as well as the manner of training is also given, and the prospects which it opens up to a boy of the right sort. The booklet, which is bound in cloth and amply illustrated, may be purchased through the government publishers at the price of eightpence.

NEW COURSE OF NAVAL TRAINING.—There is a very general belief in the Senior Service that the system of training for midshipmen and acting sub-lieutenants recommended by the committee over which Admiral Sir Reginald Custance presided, and which was in the main adopted by the Board of Admiralty, will be found to be much better in its practical results than the system it has displaced. More precise instructions have been given, so as to

ensure that the training in sea-going ships shall be so directed as to give the midshipmen and sub-lieutenants a more practical knowledge of engineering, as well as gunnery, torpedo, navigation and pilotage, and also in seamanship. All these are essentials to officers under training to perform the duties of a lieutenant. The regulations for the examination for the rank of lieutenant have also been revised. After two years and four months' service, midshipmen will undergo examinations at sea in seamanship and navigation, and those who pass will be rated acting sub-lieutenants, the examination in seamanship being final, and that in navigation preliminary only. Acting sub-lieutenants remain at sea for three months after promotion to that rank, and at the end of that period undergo examinations in gunnery, torpedo, and engineering. The examinations in gunnery and torpedo are to be held at sea and, pending further experience, will be preliminary only. The examination held at sea in engineering is to be final. After this, short recapitulatory courses are to be gone through in the respective Schools of Gunnery, Torpedo and Pilotage, and then the final exams take place.—*United Service Gazette.*

The Premier of New Zealand recently stated that the Pacific would be "the storm center of the future." A few years ago an Oxford professor made even a more remarkable prophecy when he said that the cutting of the Panama Canal and the awakening of Asia, with its vast population, would exercise "a profounder influence upon the destinies of mankind than the discovery of America by Columbus." Admiral Mahan, the historian of sea power, has declared that "the question of the Pacific is probably the greatest world problem of the twentieth century." If the Pacific is a great problem to the world generally, it is one of transcendent importance to the British peoples, for three-fourths of the Empire is washed by these waters.

It is apparent that the mother country, besides providing for the defence of Imperial interests in the North Sea and the Mediterranean, cannot deal with the insistent problem which the Pacific will present in the course of the next few years. It is equally true that the dominions which are specially interested in this problem cannot unassisted solve it. Yet mother country and dominions will realize increasingly in the course of the next few years that this ocean must be a white man's ocean, or the Empire will be imperilled.

The alliance with Japan is at present more essential to that country than it is to the British people, and it accords with both our needs. It has proved, and it will continue to prove for some years to come, a convenient expedient for bridging over the period of confused thought and policy which, under democratic conditions, necessarily ensue between the death of an old order and the birth of a new order. The alliance, however, is not a permanent political factor. This will be recognized more and more as men's gaze is attracted to the Pacific by industrial development in this part of the world and the struggle for commercial supremacy. It may last for ten years, or even for twenty years. Whichever it be, the period will be the limit of time available to the British peoples for making adequate preparations for re-asserting their power and influence in this vast ocean. The future of the Empire depends upon the use which is made of the years which, it may be hoped, will intervene before the Pacific does, in fact, become "the storm center of the world."

There is only one way of securing a "white" Pacific, and that is by arranging for the closest co-operation between the mother country and the dominions in maintaining the general naval supremacy of the Empire.—*Naval and Military Record.*

GREAT SEA FIGHTS AHEAD.—Yet with such mighty issues pending the cry has gone up in this country to limit the construction of the British fleet, and in her far-seeing policy which has made her fleet a deliberate menace to our Germany is looked to do the same with her navy. Already she rejoices own, and she gazes further into the future and sees it supreme upon the seas, frustrating the natural development of our Empire. There are great days and great sea fights ahead of us, and the Big Englanders must see to it

that our kinsmen in the Pacific Ocean have all the ships of the line they need to defend their heritage. Germany believed the Franco-German war of 1870 to be inevitable, and she was prepared for it. No less is it an article of faith with her that a conflict for world supremacy is inevitable between England and herself, and who will deny that she is not unceasingly preparing for the day of battle? Von Moltke, who planned the defeat of the French armies, held firmly to the conviction that war was an element in the order of the world established by God, and though in England we do not agree with this belief, it is well to remember that it is the gospel of the war party in Germany who are the directors of her world policy. We ardently long for peace, but do not let us expect it until the issue has been fought out between ourselves and Germany, not necessarily with bloodshed, but by showing that we are determined to remain invincible on the seas.—*Naval and Military Record.*

COST OF WARSHIPS.—There have just been issued the annual accounts of shipbuilding and dockyard transactions, etc., including manufactures, for 1912-13, with the report of the comptroller and auditor-general thereon. These make a rather formidable volume of over 160 pages. Especially interesting is the part of the comptroller and auditor-general's report, which deals with the vessels completed in 1912-13. This states that provision was made in the estimates for the completion of eight armored and four unarmored ships, 24 torpedo-boat destroyers, six submarine boats, and six miscellaneous vessels. Five of the armored ships, *King George V, Thunderer, Conqueror, Lion,* and *Princess Royal,* were completed in the year. The completion of the other three, the *Centurion,* the *Ajax* and the *Queen Mary,* was shown in the estimates for 1913-14 as deferred to that year; delay was caused by the alterations to conning-tower, bridges, masts, etc., and also, in the case of the *Centurion,* by a collision with S. S. *Derna* and by late delivery of materials. The four unarmored ships, *Amphion, Chatham, Dublin,* and *Southampton,* were all completed. Of the 24 torpedo-boat destroyers, one was completed in 1911-12, and 14 in 1912-13, leaving nine for completion in 1913-14. Two of the six submarine boats and three of the six miscellaneous vessels were completed.

A statement comparing the original estimate with the actual cost of ships and floating docks completed in 1912-13 is appended. Further expenditure incurred in 1913-14 (to the end of January, 1914) is taken into account in the comparison.

Name of ship	Original estimate £	Total expenditure £	Expenditure compared with estimate £ less than estimate
Dockyard-built			
King George V	1,816,796	1,775,126	41,670
Amphion	267,819	262,739	5,080
			More than estimate
Lion	1,875,244	1,967,813	92,569
Chatham	316,624	329,918	13,294
Contract-built			
Conqueror	1,725,309	1,748,502	23,193
Thunderer	1,745,828	1,746,058	230
Princess Royal	1,912,166	1,963,386	51,220
Dublin	315,658	321,844	6,186
Southampton	314,678	323,976	9,298
Floating Dock, No. 1	265,017	268,434	3,417
Floating Dock No. 2	267,320	270,847	3,527
Floating Dock, No. 3	23,680	28,523	4,843
Floating Dock, No. 4	20,637	23,516	2,879

—*Naval and Military Record.*

An interesting item given in the estimates is the "total estimated average annual cost of maintenance," and this, in the various classes, is as follows: *King George V*, £131,695; *Iron Duke*, £145,505; *Queen Elizabeth*, £170,410; *Queen Mary*, £182,880; *Tiger*, £183,680. It is a pity that full details were not given of the items included under the cost of maintenance. Presumably the "total average" cost would include the whole period of the ship's life, from her first commissioning to her last paying-off, the ship being for perhaps a half of this period in reserve. At any rate, six years ago it was officially stated that the average annual cost of keeping a battleship in full commission was £231,500, this allowing for interest at 3 per cent on the first cost, depreciation of capital, wages, a proportionate charge for pensions, repairs, renewals, etc., and assuming the life of the ship as 20 years.—*Naval and Military Record.*

It seems, according to official figures, that in the U. K. Royal dockyards can now build battleships cheaper than private yards. The completed cost of the *Valiant* (Fairfield) is given by the British Admiralty as £2,356,133, and that of the *Barham* (John Brown), as £2,348,078. The *Warspite* (Devonport) is costing £2,325,328, and the *Queen Elizabeth* (Portsmouth) is the cheapest of the batch at £2,314,762. The differences are certainly not very wide, but the dockyards cover a bigger economy than is shown. The completed cost of their ships includes opening-up for Admiralty acceptance (always a five-figure business), but the privately built vessels are handed over to the government yards for this purpose which comes under dockyard expenditure.—*Shipping Illustrated.*

BATTLESHIPS FOR THE MEDITERRANEAN.—It is announced that towards the end of 1915 the Admiralty intend to form "a line-of-battle squadron in the Mediterranean." According to Mr. Churchill, the principal reason for this decision is that England must remain "the independent guardian of her own important and long-established interests in the Mediterranean," and must "not incur any exceptional obligation in any direction." This is not only an explanation of the Admiralty's action, but it provides a criterion by which the adequacy or inadequacy of the squadron in future years must be judged. It is intended to place in the Mediterranean eight battleships, six at least of which will be of the dreadnought or *Lord Nelson* types. The four battle cruisers are to be withdrawn, and the British representation in the Mediterranean will therefore comprise eight battleships, together with four large armored cruisers, four light cruisers of the *Town* class, 16 destroyers of the *Beagle* type, and a submarine flotilla. This is the squadron which is to be formed in the Mediterranean at the end of next year, and it will adequately support our prestige in these waters for the time. It represents, in Sir Edward Grey's words, "a respectable force," and shows that the government have no intention of abandoning the Mediterranean.—*Naval and Military Record.*

Mr. Churchill stated on the 17th of March that by the end of 1915 a battle squadron of eight ships, six being of the dreadnought or *Lord Nelson* types, would be stationed at Malta in place of the four battle cruisers now nominally based there. Including the *Revenge, Resolution*, and *Ramillies*, England's completed dreadnought strength (excluding the *Australia*) will then comprise 30 battleships and nine battle cruisers, so that after allowing for four or six at Malta, the number remaining in home waters would be 33 or 35. The latter number would preserve the necessary 50 per cent superiority over Germany (with 23 completed dreadnoughts), but a few months later the position would be changed by the completion of the *Royal Oak* and *Royal Sovereign* on one side, and of the *Ersatz Worth*, "*T*" and *Ersatz Hertha* on the other. It is anticipated that Italy will have six and Austria four completed dreadnoughts by the end of 1915.—*The United Service Magazine.*

MR. CHURCHILL'S ACTIVITY.—Whatever allegations may be levelled against the present First Lord of the Admiralty, either as an administrator or as a politician, none of his opponents can accuse him of lack of energy in the affairs of the Senior Service. One day he is up in the air at the helm of a seaplane; another day he is down in a submarine with the officer in the conning-tower; and on yet another occasion we see him on the bridge of a new battleship accompanying the captain of the *Excellent,* when carrying out gunnery trials. Not content with these adventures, he gains further first hand knowledge on the bridge of a fleet flagship, watching a line of capital ships throwing deadly salvos and broadsides at an old armored giant, at one time the pride of the fleet, but now a target, to test the effect of modern gun-fire. All these activities furnish Mr. Churchill with detailed information of this service, over which he presides, which was never before, in modern times, acquired by any First Lord who was not also a naval officer. But it is in knowledge of the aerial branch of the naval service in which the ubiquitous First Lord shines the most; for this is a child of his own, so far as that expression may be permissible to an arm of the navy which has grown up under the presidency of the head of a branch of His Majesty's Forces. The naval air service has come into full activity during his tenure of office. When he joined the Admiralty about two and a half years ago, there were four aeroplanes and five biplanes; whereas the navy now owns 103 aeroplanes, 63 of which are seaplanes, and it will shortly have a total of 15 airships. There are five seaplane stations already erected around the coast, two more are being built, and the ground has been acquired for others, while a large aerial center is being established in the Medway Valley. There are nearly 130 regular naval air-pilots, and 20 officers who have taken their Aero Club Instruction Certificates. The Naval Aerial Service now consists of 120 officers and 500 men, and it is expected that by the end of the year the total may reach 180 officers and 1500 men. At the aerial stations arrangements have also been made for the satisfactory housing of the officers and men and their machines, the comfort of the personnel receiving special attention, as it is held that such arrangements have a direct relation to safety of life.—*United Service Gazette.*

OFFICIAL SECRETS.—Mr. Yerburgh, M. P., having asked the First Lord of the Admiralty whether, in view of the international character of some of the great armament firms, the Board of Admiralty are in a position to assure the country that adequate safeguards are employed to prevent British inventions, designs, and improvements relating to warcraft of all kinds being used for the benefit of foreign powers.

Dr. Macnamara, replying in the Parliamentary papers, states that the armament firms employed by the Admiralty are British firms, having their domicile and register in the United Kingdom. Their directorate and main shareholders are British. The fact that some of these firms have branches in foreign countries, or undertake work in the United Kingdom for foreign countries does not affect the fact that the companies are under British control and amenable to British law, including the Official Secrets Act. All contracts that in any way comprise confidential matters contain strict stipulations in regard to the observance of the Official Secrets Act and other necessary precautions. The Admiralty have no reason to doubt the adequacy of the steps taken in all matters that admit of being treated as government secrets or of being kept confidential in national interests. The government does not interfere with the construction of armaments of contractors' design for foreign powers, and cannot, any more than any other government, necessarily monopolize all inventions and improvements, many of which from their nature could either not be kept confidential at all, or only for a very limited period.

THE NEW NAVAL CONFERENCE.—At last the government have decided to hold a conference with Dominion statesmen on the problem of naval defence. The Prime Minister has announced that this decision has been reached, and presumably the date when the conference will be held will be

fixed to suit the convenience of the statesmen from overseas. At present the idea apparently is to invite the co-operation only of the governments of the Commonwealth of Australia and the Dominion of New Zealand, which seems to suggest that consideration will be given in particular to the problem of the defence of Imperial interests in the Pacific. Although, in the first instance, it may be intended to invite the presence only of representatives of the two Dominions which have been most clamant for a conference, probably the government of the Union of South Africa, which is also interested in this matter, and is pledged to confer with the Admiralty, will desire to take part. The position of Canada is peculiar. There a political deadlock exists. The Naval Aid Bill is for the time in a state of suspended animation, and Mr. Borden has undertaken that, when it has been passed, he will take the opinion of the Canadian people on the broad issue as to whether they desire a local fleet or prefer to co-operate with the mother country in the general defence of the Empire. To what extent the action of New Zealand and Australia will affect the views of Mr. Borden's Cabinet is unknown. It would, however, be a very fortunate development if the Canadians decided to attend the Conference. In that event the meeting in London would assume an importance which otherwise it cannot have, and we might look forward to the evolution of a policy of naval co-operation to which every self-governing section of the Empire could subscribe. Of course, the truth is that the Conference comes too late and too early. It is too late because already New Zealand has committed herself to a definite line of policy by Act of Parliament, and that policy can only be changed by the passage of an amending act. On the other hand, the Conference comes too early, in the opinion of Mr. Borden's government, because it was hoped to solve the political problem in the Dominion before attention was turned to the consideration of a permanent naval policy. It may be, however, that if Canada joins in the Conference the proceedings may suggest to Mr. Borden some variation of his emergency methods which would unite both parties in Canada in the common cause of Imperial safety.

The fact that Mr. Asquith has himself now gone to the War office suggests that it might be possible for him, as Prime Minister, to remain in name and in fact Minister for War with a general supervision not only over the Admiralty and the War office, but over all the other departments which would be called upon to co-operate in case of hostilities. This would involve only one change—the creation of a Minister for the army, corresponding in status to the First Lord of the Admiralty, and, like him, subordinate to the Minister for War. It has always been recognized that the present nomenclature is absurd, since the Secretary for War has no direct responsibility for what is, after all, our first line of defence. Cabinet organization would more closely correspond to national policy if the Prime Minister took upon himself the duty of Secretary for War, leaving to two subordinate Cabinet Ministers the departmental duties in connection with the two offices. Such a change, however, would involve a great increase in the work falling to the Prime Minister, and it is not certain that any man could be found with the mental capacity and the physical endurance to enable him to bear so heavy a burden. However this may be, no one can doubt that the development would tend to the efficiency of the national defensive services and would promote closer co-operation. In effect we should thus set up in time of peace the organization which, there is every reason to believe, would be essential under war conditions. As soon as war breaks out, the Prime Minister must inevitably become practically War Minister as well, and there is everything to be said in favor of facing facts while peace still reigns and adapting our machinery coolly and methodically to the admitted needs of war.—*Naval and Military Record.*

BRITISH HELP FOR FOREIGN NAVIES.—China is faring the least well at our hands in obtaining a group of naval officers and men to proceed to the Far East, under Captain Harold Christian, R. N., to build up that new and

efficient naval force that her Republican leaders believe to be necessary to her best interest. Six officers are needed for the mission, but up to the middle of April only three could be found to volunteer for the task from the British Navy. The fact is that previous naval missions to China from this country have not received the sort of treatment at the hands of Chinese Mandarins that British officers expect to get from their employers. In some cases the good faith in keeping contracts by the Chinese authorities has been brought into question. Whether it will be different under Republican authorities to what it was under the old Dowager Empress régime remains to be seen. Meantime, no difficulty has been found in obtaining British naval officers to meet the naval requirements of Turkey and Greece for the same purpose as the Middle Kingdom needs our help. But it is a striking example of how generously the Admiralty deal with all reasonable requests for help in this direction by foreign nations, to note that while one group of British instructors go to the Golden Horn to prepare a Turkish fleet to hold the Greeks in check, another group of British officers proceed to Athens to help the Greeks build up a fighting squadron that will be capable of dealing with the Turkish fleet wherever it may be found by the commander of the Greek squadron. It may be that these fleets will never again be matched against each other, but there is no denying that they are being made efficient for that purpose.—*United Service Gazette.*

THE HAGUE TRIBUNAL.—In April there was issued the text of a bill that will, in course of time, have important bearings on the conduct of maritime warfare. Considered, however, in the light of recent events in our maritime arrangements all round, and the lack of uniformity that exists concerning armament regulation as between the great powers, it is difficult at present to see where the ramifications of the Second Peace Conference Conventions Bill will lead, except that it is another step on the road towards a consolidated peace for Europe, which, thanks to our late King, has become a problem showing signs of possible settlement. Sir Edward Grey has become responsible for the bill with Mr. Churchill, the Attorney-General, the Solicitor-General and Mr. Acland supporting it. Its main features are to provide for the adaptation of the Geneva Conventions and their general principles to maritime warfare, and with the idea of making the Hague Tribunal more like an ordinary court for the settlement of international disputes, it proposes to give the Secretary of State power to compel witnesses to attend and produce all documentary evidences required by the Convention Court; in fact if the bill becomes law we have another wedge driven into the opening that is to separate wanton destruction of life and national property from the more humanized warfare which civilized powers should try to conduct once the *causus belli* exists.—*United Service Gazette.*

WHAT OTHER NATIONS ARE DOING ON THE SEA.—It is fact worth noting that, according to Lloyd's compilation, the Italians made more gain, proportionately, last year in ocean shipping than any other nation in the world. Their shipbuilding output increased 100 per cent, and much of it was very high quality.

Our American Consul at Genoa reports that two very large and luxurious passenger liners are under construction for the South American trade. They are to run from Genoa to Buenos Ayres, and are to be the finest vessels in that service. Their huge size—22,000 tons—makes them equal to most North Atlantic liners, and their speed of 20 knots is a record-breaking rate on long voyages like those to South America. The two ships are to be 640 feet in length, and are to have accommodations for 2500 passengers. No vessel of this magnitude has ever been built in Italy before—no ship so large has ever been built in the United States. The cost will be between three and four million dollars.

Italy encourages her merchant marine by liberal subsidies and bounties to her steamship lines and bounties to her engine works and shipyards.

Like every other nation that ever tried this policy in an intelligent and systematic way, she has found it highly advantageous to her trade.

Germany is another European power that is moving ahead on the ocean. She does not give many direct subsidies, but puts the powerful indirect influence of her Imperial government and the patriotic sentiment of her people behind her steamship lines. The Hamburg-American Company of Hamburg, greatest of the world's steamship corporations, has a fleet of important new ships under construction and among them the 24,500-ton *Admiral von Tirpitz,* intended for the trade through the Panama Canal. This ship is equal to most of the trans-Atlantic passenger liners and is distinguished by possessing a new type of turbine engine, the result of five years of German experiments at the great Vulcan Works.

Time was when Great Britain ruled the seas, but the European nations of the Continent are becoming more and more her formidable competitors. —*Marine Journal.*

ABSTRACT OF THE ESTIMATES.—In the following abstract of the estimates, the figures for 1914-15 are shown in the first column; the original estimates for 1913-14 in the second column; the estimates of 1913-14, as amended by the supplementary vote of February 20, 1914, in the third column; and the differences between the 1914-15 estimates and the revised estimates of 1913-14 in the fourth column.

Votes		Net Estimates			
		1914-1915	1913-1914	1913-1914 (Revised)	Differences
	I.—NUMBERS	Total Numbers	Total Numbers	Total Numbers	Numbers
A.	Total Number of Officers, Seamen, Boys, Coast Guard and Royal Marines	151,000	146,000	146,000	5,000
	II.—EFFECTIVE SERVICES	£	£	£	£
1	Wages, etc., of Officers, Seamen, Boys, Coast Guard, and Royal Marines	8,800,000	8,399,200	8,362,200	437,800
2	Victualling and Clothing for the Navy	3,092,000	2,930,000	3,018,000	74,000
3	Medical Establishments and Services	292,100	272,200	272,200	19,900
4	Civilians Employed on Fleet Services	115,300	99,500	99,500	15,800
5	Educational Services	175,000	159,700	159,700	15,300
6	Scientific Services	64,700	66,200	66,200	1,500*
7	Royal Naval Reserves	489,900	476,000	476,000	13,000
8	Shipbuilding, Repairs, Maintenance, etc.:—				
	Section I.—Personnel	3,989,800	4,063,100	4,151,100	161,300*
	Section II.—Matériel	7,087,400	5,851,600	6,584,600	502,800
	Section III.—Contract Work	14,287,800	12,226,300	13,351,300	936,500
9	Naval Armaments	5,544,300	4,396,000	4,716,000	828,300
10	Works, Buildings, and Repairs at Home and Abroad	3,595,500	3,448,000	3,508,000	87,500
11	Miscellaneous Effective Services	523,700	494,600	617,600	93,900*
12	Admiralty Office	483,500	450,000	450,000	33,500
	Total Effective Services	48,541,000	43,332,400	45,832,400	—
	III.—NON-EFFECTIVE SERVICES				
13	Half Pay and Retired Pay	1,003,700	1,005,800	1,005,800	2,100*
14	Naval and Marine Pensions, Gratuities and Compassionate Allowances	1,605,900	1,562,100	1,562,100	43,800
15	Civil Superannuation, Compensation Allowances and Gratuities	399,400	409,000	409,000	9,600*
	Total Non-Effective Services	3,009,000	2,976,900	2,976,900	—
	Grand Total	51,550,000	46,309,300	48,809,300	2,740,700 (Net Increase)

*Signifies decrease; the other sums refer to increases.

FIRST LORD'S SPEECH.—The estimates were introduced in Committee of Supply on March 17, when the First Lord made his speech, the more important points of which are summarized as follows:

COST OF MAINTENANCE.—In three years there has been an increase of £6,250,000 in the cost of maintenance, apart from new construction. A sum of £2,120,000 is accounted for by pay, wages, and victuals, and the fact that there are more men. A second cause amounts to £1,500,000 for oil reserves, that is, capital expenditure and an increase this year over 1911 for oil reserves. Thirdly, the air service, practically non-existent three years ago, requires £900,000 in the new estimates. Allowing this total of £4,520,000 under the three heads, only £1,750,000 is left for all the needs of a larger fleet, more costly ships, and the whole scientific development of the naval service. The increased cost of maintenance is either automatic or else it is proportionate to the larger and more powerful fleet we are forced to keep in being.

OIL FUEL.—The chairman of the Royal Commission on Fuel and Engines (Admiral of the Fleet Lord Fisher of Kilverstone), in a memorandum submitted to the First Lord with the unanimous assent of the whole of the Commission, states that the radius of action when using oil in place of coal is increased at least 40 per cent for the same weight of fuel. The use of oil enables a fleet to refuel at sea with great facility. The British fleet is not forced to leave its fighting position to refuel; its strength is thereby increased by at least 25 per cent. Oil bunkers can be replenished with great rapidity, and without interfering with the fighting efficiency of the ship, and a few men suffice for the work. A reduction of some 55 per cent of stokehold labor can be made, by the saving of labor involved in coal-trimming, stoking, removing ashes, clinkers, and soot. Oil admits of a very rapid increase of steam production and of eliminating variations of steam pressure. It can be stowed in places aboard ship from which it would be impracticable to bring coal to the furnaces.

OIL RESERVES AND SUPPLIES.—The immense burden of building up the oil reserve out of income has been borne. Oil in great quantities has been purchased and is in this country. Oil is a marketable commercial asset, which it is no exaggeration to say could be realized in a reasonable period of time for what it has cost us. We have to build up in these few years out of income the whole of the storage. Those great tanks and pipe lines, which connect them and deliver the oil at the jetty to ships of all kinds, are a capital charge which will not recur upon the estimates. There are 14 oil-tank vessels built and building at a cost of approximately £1,400,000. Four are at present delivered, one of which has already, during the high freights which have prevailed during the last two years, earned the greater part of its original cost.

INCREASED PERSONNEL.—Recruiting this year has been in every way satisfactory. Not only have we got the full numbers authorized, but we have got the proper proportion of almost every rank and rating. We have had to raise the standard so as not to overshoot the numbers authorized by Parliament. We can, at this moment, man fully our whole fleet on mobilization. Increased complements are needed for our ships on account of the large batteries of 6-inch guns now provided, of the range of the torpedo, and of the scientific development of fire-control. There is also the increase due to the air service. In 1920, under the German Navy Law, Germany will have 108,000 men in the navy, and that figure is being reached by increments of about 6000 a year. While this process continues it is obvious that large increases will be required from us.

SUPPLY OF OFFICERS.—The expansion of the fleet having taken place more rapidly than it is possible to train officers, special measures for increasing the number have been adopted. The war fleet in 1920 has been kept in view, as officers take so long to train. It is significant that 440 cadets are received this year into the German naval colleges, as against about 220 received into Osborne for the British Navy. From the Royal Naval Reserve, 60 supplementary lieutenants have been engaged, and before the end of 1914 that number will have reached 100. Forty-one special entry cadets of 18 or 19 years of age are now training on board the *Highflyer*. At least 200 lieutenants are anticipated from this source by 1920. From the lower deck, 13 mates promoted are now at sea. With 31 undergoing instruction, 22 more qualifying, and 35 more to be qualified by March 31, 1915, there will be a total of 101 promotions from the lower deck within a period of three years. In the engineering branch 50 mates (E) will be promoted by March, 1918. The direct entry of marine lieutenants has produced 44 of those officers, and two have been promoted from the ranks. From all these additional sources, apart from the supply yielded from the colleges, it is expected to receive by 1920 between 800 and 900 additional lieutenants.

ACCELERATED RETIREMENT.—It is proposed to introduce forthwith a series of regulations for the accelerated retirement of senior officers, by reducing the periods of non-service leading to retirement to three years for admirals and vice-admirals, two and a half years for rear admirals, and two years for captains and commanders. No officer unemployed for any of the periods stated has a chance of being further employed, but if an exceptional case were to arise it could be dealt with by special order in council. A further new regulation is that rear admirals who have not hoisted their flags at sea shall be retired on promotion to vice-admirals. This will ensure that all vice-admirals shall have commanded at sea. In order to give a greater selection on the rear admirals' list, it is proposed to retire captains on promotion to rear admirals, if the Board of Admiralty decide not to employ them further, whether for professional reasons or for ill-health. The decision in each case will be arrived at after full consideration by the Board of Admiralty on the merits of the officer and the reports of flag officers under whom he has served.

NEW RANK: "LIEUTENANT COMMANDER."—The Admiralty are instituting a new rank of "lieutenant commander." At present there is no new rank at all between the young sub-lieutenant who gets his commission as a lieutenant at 21 and the lieutenant who is promoted to commander, perhaps 10 or 12 years later. Such a great gap as that ought not to be unbroken by a definite change in title. The present arrangement is that at eight years an extra half-stripe is mounted by the lieutenant, and he then ranks with a major in the army. The Admiralty think this should be further consolidated by the institution of a definite substantive title, and propose, therefore, that every lieutenant of eight years' standing shall be called "lieutenant commander." Lieutenants under eight years' service in command of vessels, torpedo-boats, or destroyers will be called "lieutenants in command," and not by the name of "lieutenant and commander," as is the present practice.

The navy is no longer the unstable body it was, but offers security to those who adopt it as a profession and follow it loyally. Prize money is not needed either as a bait or as a consolation. There is no question of the honor and zeal of naval officers. They are the best judges of the injustice which gave the rewards for peril and hardship to those who had the easier work to do. They will be the last to find fault if what is taken for the state is disposed of for the state in the interest of the country.

No one will regret the abolition of prize-money unless it be those who might possibly have acted as agents for its distribution, but everyone in the service will rejoice to learn that the government is sound on the question

of the capture of private property at sea. Some objections have been raised to the arming of merchantmen, but apparently these views are not largely shared by the shipowners, for some 70 food-carrying vessels are to have guns for the purpose of defending themselves against similarly-armed vessels of the enemy. At the end of his long and interesting speech, crammed full of instructive detail and useful information, Mr. Churchill dealt with the question of the protection of Imperial interests in the Pacific and the burden of responsibility thus laid upon the British Navy. He referred again to his project of an Imperial squadron, in which all the Dominions are to be represented, but how this aspiration is to be squared with the employment of the Dominion ships or substitutes for them as a battle fleet in the Mediterranean will puzzle many. The right answer, no doubt, is to be found in his statement: "No European power would or could invade and conquer the Dominions unless the British Navy had been destroyed." He showed also how little Australasia has to fear from Japan, to whom the protection of the British fleet is a necessity. And, in a striking sentence, he said: "If the power of Great Britain were shattered on the sea, the only course open to the five millions of white men in the Pacific would be to seek the protection of the United States.—*Army and Navy Gazette.*

SUBMARINES.—The submarine programme of the year is large enough in view of our effective lead in this type of vessel, but further effort will be required in the near future on account of what is going on elsewhere. We are increasingly convinced of the power of the submarine and the decisive part which this weapon, aided perhaps in some respects by the seaplane, may play in the naval warfare of the future. The personal element counts for much in this service, and we are lucky. Frequently in all weathers, in deep water, far out at sea with no attendant vessel, submarine flotillas exercise with audacity against a swiftly moving fleet or squadron. A certain amount of risk is unavoidable if the captains are to acquire the necessary practical experience. The peace risks of submarine service approximate more nearly to war risks than in any other branch. We have at present 268 officers and 3000 men, all thoroughly trained in the submarine service.

DESTROYERS.—The destroyer flotillas are at present maintained upon an establishment of 80 destroyers in the first fleet, which will be reached before the end of the year, and an equal number in the patrol flotillas. The latter are manned with active service ratings in time of war. They could not keep the sea for a long time with their reduced complements, but they can perfectly well discharge their functions for a few days before taking on their balance crews—they are instantly ready for sea. The steady influx of new boats makes it necessary to de-grade older vessels continually. We are considering a scheme for establishing reserve flotillas to correspond with the third fleet, to be filled in part with reservists who have reason to serve in the flotillas when mobilized. We are using them in order to reduce to the narrowest limits compatible with efficiency the oil consumption of the flotillas while we are building up a reserve, and an intricate system has been devised by the flotilla officers with the approval of the board which has effected a considerable saving.

PRIZE MONEY.—The Board of Admiralty have decided to recommend to the government the abolition of prize money. There is a strong feeling among naval officers that the private enrichment of individuals by acts arising out of warfare is not compatible with the highest conception of the naval or military profession. It has been abolished in connection with the army, and I believe it is in accordance with the best naval opinion that a similar step should be taken in regard to the navy. The question of issuing some grant or bounty to the sailors during the course of a war in consideration of the change which has been made is one which should receive the attention of the treasury.

STANDARDS OF STRENGTH.—The two-power standard having becomes meaningless, the 60 per cent standard of superiority in vessels of the dreadnought type over the German Navy, on the basis of the fleet law before its latest amendment, with two keels to one for every ship added to that law by the last or subsequent amendments, was adopted by the Admiralty in 1908-09. That is the standard now being followed. It is not, of course, eternal, and still less could it be made a binding international instrument. There have been various disputes about what ships should come into it. The Admiralty have no need or intention to enter into such a controversy. Programmes supersede standards, and actual figures are better than percentages. We have now reached the third of the six programmes in the series outlined two years ago (4, 5, 4, 4, 4, 4, as against the German construction of 2, 3, 2, 2, 3, 2), and after a full survey of the whole situation we consider that four ships are enough for the programme of this year.

MEDITERRANEAN SITUATION.—In July, 1912, the Cabinet, having made a new and searching examination into the Mediterranean problem, decided that a British battle squadron should be maintained in that sea, and that we could not afford to leave our interests there indefinitely to the care of powerful cruiser squadrons and flotillas. Accordingly, it is proposed to place in the Mediterranean, by the end of 1915, a battle squadron based on Malta of eight battleships, six at least of which will be dreadnoughts or *Lord Nelsons*, and to substitute this force for the four battle cruisers that are now stationed there. This will make our force in the Mediterranean, by the end of 1915, consist of eight battleships, four large armored cruisers, four light cruisers of the *Town* class, and 16 destroyers of the *Beagle* type. That we consider to be an adequate representation of our strength for all purposes in the Mediterranean during that year.

CANADIAN ASSISTANCE.—The failure of the Canadian Naval Aid Bill obliged the Admiralty to begin three ships of the 1913-14 programme eight or nine months earlier than was originally proposed. Owing to the adverse majority in the Canadian Senate, the Canadian Government will be unable to renew the Naval Aid Bill in the present session. It is, therefore, necessary for us to repeat, though on a smaller scale, last year's course, and to begin two ships of the 1914-15 programme at the earliest possible moment. There are good prospects that the unfortunate deadlock which has arisen in Canada upon this navy question will be relieved. After all, Canada ought to make some provision for her own naval defence. If she were annexed to the United States of America she would, no doubt, contribute taxation to the upkeep of the United States Navy. If she were independent, she would, no doubt, have to make provision at least equal to that which is made by the most powerful South American States. Canadians of every party feel that it is not in accordance with the dignity and status of the Dominion to depend entirely upon the exertions of the British taxpayers, many of whom are much less well off than the average Canadian.

PACIFIC SITUATION.—The safety of Australia and New Zealand is secured by the naval power of Great Britain. No European State would or could invade or conquer them unless the British Navy had been destroyed. The same naval power of Great Britain in European waters also protects New Zealand and Australia from any present danger from Japan. If the power of Great Britain were shattered on the sea, the only course open to the five millions of white men in the Pacific would be to seek the protection of the United States. The situation in the Pacific will be absolutely regulated by the decisions in European waters. Two or three Australian and New Zealand dreadnoughts, if brought into line in the decisive theater, might turn the scale and make victory not merely certain but complete. The same two or three dreadnoughts in Australian waters would be useless the day after the defeat of the British Navy in home waters. The Dominions want to

have something they can see, with feelings of ownership and control. Those feelings, although unrecognized by military rules, are natural, they are real facts which will govern events. The Admiralty have, therefore, co-operated largely to the best of their ability in the divertment of the Australian fleet unit.

RECORD OF WORK AND PROGRAMME OF SHIPBUILDING.—The statement of work done by the department last year, although interesting as a record, contains little that is new and has no revelations of policy. Most of the events referred to will be found dealt with in past issues of the *Journal*. Under construction, it is announced that instead of three destroyers authorized last year, two large boats for use as flotilla leaders are being built, and it is stated officially that they will be called the *Lightfoot* and *Marksman*. Under works, reference is made to negotiations for land at Cromarty on which to erect accommodation for marines, who will be employed in the defence works there. Under personnel, it is stated that a committee, with Rear Admiral Sir Edmond Slade as president, has reported upon the training of the Royal Naval War College, in the light of present service requirements, and of the recent establishment of the War Staff. Under Royal Marines, the concession of the Army Council in considering major-generals of marines for appointment in army commands, in connection with which the first appointment has been made, is noted in appreciative terms. In the programme of shipbuilding, the particulars given of the *Iron Duke* class show them to be of 25,000 tons, 21 knots, and to have a secondary or anti-torpedo defence armament of twelve 6-inch guns. The dimensions of the *Tiger*, of the same programme, are not given. No less than seven types of submarine are under construction, five distinguished by letters— *E*, *F*, *S*, *V*, and *W*—and two by the names of *Nautilus* and *Swordfish*, this being the first time that names have been given to British submarines. "Air Craft" also figure for the first time in the list of new shipbuilding, and a sum of £80,972 is also taken for a "ship for carrying seaplanes."

GREECE

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battle Cruisers					
Salamis	19,500	23	8 14-in., 12 6-in., 12 3-in.	Vulcan Works, Stettin	Laid down July, 1912
.....	24,000	21.5	10 14-in.	Saint Nazaire	Reported that negotiations have been completed for this ship.

NEW DREADNOUGHT.—According to advices from Athens the Greek Government has decided to order a dreadnought, and the negotiations for placing the order have been practically concluded with a French yard at Saint Nazaire. The size of the ship is to be 24,000 tons, and she will carry ten 14-inch guns. The speed is to be 21½ knots. No other yards were requested or allowed to tender.—*Shipping Illustrated*.

"FEI HUNG" PURCHASED.—The light cruiser *Fei Hung*, built in Camden, New Jersey, has been purchased by the Greek Government. The armament was manufactured by Armstrong, Whitworth Co. and the gunnery trials have been satisfactorily completed under the supervision of this firm's representatives. A complete description of this cruiser was published in the Professional Notes of the March-April number.

ITALY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Giulio Cesare ...	22,022	22	13 12-in., 18 4.7-in.	Genoa	Trials April 1914
Conte-di-Cavour	22,022	22	13 12-in., 18 4.7-in. 14 14-pdr.	Spezia	Launched Aug. 10, 1911
Leonardo da Vinci	22,022	22	same	Genoa (Odero)	Trials April 1914
Andrea Doria...	22,564	23	13 12-in., 16 6-in.	Spezia	Launched March 30, 1913
Duilio.....	22,564	23	same	Castellamare	" April 24, 1913
4 ships	28,000	24	8 15-in., 16 6-in.	....	Will probably be laid down during spring and summer, 1915
Small Cruisers					
Basilicata	2,500	16.5	6 6-in.	Castellamare	Laid down Aug. 9, 1913
Compania	2,500	16.5	6 6-in.	"	" Aug. 9, 1913

NOTE.—Italy has about 15 destroyers and two submarines under construction.

PURCHASE OF CHILEAN DREADNOUGHTS.—Rumors have been circulated in the Continental and English press that Italy has entered into "confidential negotiations" for the purchase of Chile's new dreadnoughts, the *Almirante Cochrane* and *Almirante Latorre*, under construction by the British firm of Armstrong & Vickers. It is pointed out, however, that such a sale is unlikely, in view of the fact that Chile has already refused very favorable offers made by Greece. Moreover, there seems no immediate political pressure which would lead Italy to break the homogeneity of its fleet by the purchase of ships of an English type and with guns of intermediate caliber, the Chilean ships having a main armament of ten 14-inch guns, whereas the Italian dreadnoughts now completing carry thirteen 12-inch guns, and new ships about to be laid down are to mount eight 15-inch apiece. At the end of this year Italy will have six dreadnoughts in commission, while Austria will have only four, and France seven.

ITALIAN GUN CONSTRUCTION.—The first big gun constructed exclusively in Italy was forged on March 19 of this year. This is a 30.5 centimeter gun of 46 caliber, intended for one of the cruisers, *Duilio* or *Andrea-Doria*, now under construction.

"SAN GIORGIO" COURT-MARTIAL.—On March 14, the court-martial arising out of the stranding of the *San Giorgio* on November 20 found Captain Cacace, the commanding officer, guilty of negligence, and ordered him to be suspended from duty for six months. Lieutenant degli Uberti, officer of the watch, was also found guilty of negligence, and was ordered to undergo a disciplinary measure to be decided upon by the Minister of Marine. Both officers were ordered to pay costs and damages. The court of enquiry held previously exonerated Rear Admiral Cagni, who was on board at the time, from blame. Vice Admiral Viale, presided over the court-martial, which was composed of three rear admirals, three captains and two civilian officials.

JAPAN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Fuso.....	31,300	22.5	12 14-in., 16 6-in.	Kure	Launched Mar. 28, 1914
Fuso 2d.....	31,300	22.5	....	Kawasaki	Date when these ships will be laid down has not yet been settled.
Fuso 3d.....	31,300	22.5	....	Mitsubishi	
Fuso 4th.....	31,300	22.5	....	Yokosuka	Laid down Nov. 20, 1913
Battle-Cruisers					
Hiyei.....	27,500	27	8 14-in., 16 6-in., 8 t. t.	Yokosuka	Commiss'd Mar. 31, 1914
Haruna.....	27,500	27	same	Nagasaki	Launched Dec. 14, 1913
Kirishima.....	27,500	27	same	Kobe	" Nov. 30, 1913

NOTE.—Japan has two destroyers and two submarines under construction in England and France respectively.

SHIPBUILDING ARRESTED IN JAPAN.—The Imperial Navy will have to enjoy an enforced "holiday" as a result of the deletion of so much of the Budget. If the Budget of last year is to be adopted in consequence it is difficult to see, unless the Department of the Navy can obtain an appropriation of £600,000, whence it expects to derive the money to defray the cost of the vessels under construction.

The naval authorities declare, according to the *Jiji*, that in the absence of an appropriation of £600,000 for building new vessels, the department has £3,875,344 for 1914, £2,866,260 for 1915, and £50,000 for 1916, these being the funds still left over for the vessels already ordered some years ago and sanctioned by the Diet in previous sessions. These funds will be distributed in payment for the battleships *Fuso, Hiyei, Haruna, Kirishima,* and two destroyers built in England, and two submarines in France. The *Haruna* and *Kirishima* will be finished in 1916, and the money now remaining will be entirely exhausted in that year.

According to the fundamental theory of the Budget these funds are not available for any other projects. It is impossible, therefore, as some have suggested, to extend the time of finishing the *Haruna* and *Kirishima* and use the sum of £3,870,000 for 1914 to pay for battleship No. 4, work on which is already started, and the battleships Nos. 5 and 6, for the construction of which preparations have begun at the Kawasaki and the Mitsubishi yards respectively.

The Kawasaki or the Mitsubishi yard may obtain orders for merchant vessels, but this being out of the question with a naval dockyard, the keel of battleship No. 4, for instance will have to rust, and during the whole year 1914 naval builders will be forced to take a holiday. The most serious problem is to have all the skilled laborers at the navy yards scattered in consequence of this "holiday." They are difficult to gather again.

As to the appropriation of £600,000 sanctioned last year, it is to be divided among three vessels and some of the materials for these vessels have arrived, while the rest is coming. At all events, the plans for new men-of-war will have to be abandoned if the Budget is dropped for 1914.—Press Association Foreign Special.—*Naval and Military Record.*

PARTICULARS OF SUCCESSIVE SHIPS OF DIFFERENT TYPES BUILT FOR THE JAPANESE NAVY

LENGTH

PARTICULARS OF SUCCESSIVE SHIPS OF DIFFERENT TYPES BUILT FOR THE JAPANESE NAVY

Name and Type*	Length				Breadth, Extreme	Depth, Moulded	Mean Draft	Displacement	Horse-Power	Speed	Protection			Armament			Where Built	Date of Launch
	Over All		Between Perpendiculars								Belt	Bar-bettes	Battery	Deck	Ordnance			Torpedo Tubes		
	ft.	in.	ft.	in.	ft. in.	ft. in.	ft. in.	tons		knots	in.	in.	in.	in.	in.	in.	in.			
Kashima (B)	470	0	425	0	78 1¼	43 6	26 7½	16,400	15,600	18½	9	9	6	4 12	4 12	4 10	12 6	12 3; 4 3	6 M.; 3-pdr.	5	Elswick ..	Mar. 22, 1905
Katori (B)	456	3	420	0	78 0¼	44 0	27 0	15,950	16,000	18½	9	10	6	4 12	4 12	4 10	12 6	12 3; 6 3	6 M.; 3-pdr.	5	Barrow	July 4, 1905
Satsuma (B)	482	0	450	0	83 6	44 6	27 6	19,370	17,300	18¼	9	9·7	5	4 12	12 10	12 4·7	4 3; 6 3	4 M.; 3-pdr.	5	Yokosuka	Nov. 15, 1906
Aki (B)	492	0	460	0	83 7¼	44 6	27 6	19,800	24,000	20	9	9·7	7	4 12	12 10	12 4·7	12 3; 6 3	4 M.; 3-pdr.	5	Kure	April 15, 1907
Kawachi (B)	546	0	500	0	84 1¾	44 0	27 8	21,420	25,000	20	12	11	6	12 12	10 6	8 4·7	12 3; 4 3	4 M.; 4-pdr.	5	Yokosuka	Oct. 15, 1910
Settsu (B)	533	0	500	0	84 1¾	44 0	27 8	21,420	25,000	20	12	11	6	12 12	10 6	8 4·7	12 3; 4 3	4 M.; 4-pdr.	5	Kure	Mar. 30, 1911
Tsukuba (B-C)	475	0	440	0	75 0	42 0	26 0	13,750	20,500	20½	7	7	5	4 12	12 6	12 4·7	2 3; 4 3	4 M.	3	Kure	Nov. 26, 1905
Ikoma (B-C)	475	0	440	0	75 0	42 0	26 0	13,750	20,500	20½	7	7	5	4 12	12 6	12 4·7	2 3; 4 3	4 M.	3	Kure	April 9, 1906
Kurama (B-C)	485	0	450	0	75 6	42 3⅜	26 0	14,600	24,000	21	7	7	5	4 12	8 8	14 4·7	4 3; 4 3	4 M.	3	Yokosuka	Oct. 21, 1907
Ibuki (B-C)	485	0	450	0	75 6	42 3⅜	26 0	14,600	24,000	21	7	7	5	4 12	8 8	14 4·7	4 3; 4 3	4 M.	3	Kure	Nov. 21, 1907
Otowa (C)	340	0	321	6	41 4¾	26 3	15 9	3,000	10,000	22	5	5	2	4 12	6 4·7	—	4 3; 4 3	4 M.	3	Yokosuka	Nov. 2, 1903
Tone (C)	403	0	366	0	47 2	28 2	16 8	4,100	15,000	23	—	—	2	2 6	2 6	—	2 3; 2 3	2 M.	3	Kure	Oct. 24, 1907
Chikuma (C)	475	0	440	0	46 7¾	28 6	16 7	4,950	22,500	26	—	—	2½	8 6	8 6	—	4 3; 2 3	2 M.	3	Sasebo ...	Nov. 2, 1903
Hirado (C)	475	0	440	0	46 7¾	28 6	16 7	4,950	22,500	26	—	—	2½	8 6	8 6	—	4 3; 2 3	2 M.	3	Sasebo ...	Oct. 24, 1907
Yahagi (C)	475	0	440	0	46 7¾	28 6	16 7	4,950	22,500	26	—	—	2½	8 6	8 6	—	4 3; 2 3	2 M.	3	Sasebo ...	April 1, 1911
Yodo (C)	475	0	440	0	46 7¾	28 6	16 7	4,950	22,500	26	—	—	2½	8 6	8 6	—	4 3; 2 3	2 M.	3	Kobe	June 29, 1911
Mogami (G)	395	6	360	0	52 1	28 6	16 7	11,950	8,500	22	—	—	—	2 4·7	2 4·7	—	4 3	—	3	Nagasaki.	Oct. 3, 1911
Uji (G)	316	0	300	0	31 7¾	18 0	9 9	1,350	8,000	23	—	—	—	3 3	—	—	4 3	—	3	Kobe	Nov. 19, 1907
Saga (G)	316	6	286	6	27 7⅝	13 9	7 0	610	1,000	13	—	—	—	1 4·7	—	—	1 3	3 M.	—	Nagasaki.	Mar. 26, 1908
Sumida (G)	226	6	270	0	29 6	14 9	7 7	785	1,600	15	—	—	—	11 3-pdr.	—	—	3 3	3 M.	—	Kure	Mar. 14, 1903
Fushimi (G)	165	3	145	0	24 0¼	6 4¾	2 0	126	550	13	—	—	—	11 6-pdr.	—	—	3 3	3 M.	—	Sasebo ...	Sept. 27, 1912
Toba (G)	183	5	160	0	24 10¾	6 4¾	2 3	180	900	14	—	—	—	11 3-pdr.	—	—	3 3	3 M.	—	Chiswick .	June 26, 1903
Umikaze cl. (D)	323	3	310	0	28 0¼	17 3	9 0	1,150	20,500	33	—	—	—	11 6-pdr.	—	—	—	4 M.	—	Poplar	Aug. 5, 1906
Sakura class (D)	274	0	260	0	24 0⅜	15 3	7 4	605	9,500	30	—	—	—	11 4·7	—	—	—	6 M.	—	Sasebo ...	Nov. 7, 1911
Kamikaze cl. (D)	234	0	226	0	21 6¼	13 3	6 3⅜	405	6,000	29	—	—	—	11 3	—	—	5 3		4	Maidzuru, Nagasaki	—
															—	—	4 3		4	Various ..	—
															—	—	4 3		2		

* B=battleship, B-C=battle-cruiser, C=second-class cruiser, G=gunboat, D=torpedo-boat destroyer.

JAPANESE NAVY SCANDALS.—The Japanese Cabinet has fallen. This is the result of the recent naval scandals which have created such a profound sensation throughout the Japanese Empire. Practically the two Houses of Parliament determined that no more money should be spent on new ships until the naval scandals had been investigated and suitable punishments awarded. In pursuit of this policy, the Lower House reduced the estimates for the navy by about £3,000,000, and then the House of Peers cut off another £4,000,000, and thus for the moment progress with the shipbuilding programme is arrested. This may appear a curious procedure; because money has been misappropriated, therefore, it appears, the safety of Japan is to be jeopardized. It is not even as though the government had refused to investigate the scandals. As a matter of fact, several naval officers, including two admirals, are now under arrest, and will shortly be put upon their trial on charges of corrpution in connection with the placing of contracts. The allegation is that many officers have received bribes from the agents of great foreign firms. These revelations do not suggest that in this respect Japan is any worse off than many other countries. It does, however, lead to the impression that much which has been written about the morale of the Japanese services must be subjected to a considerable discount. What makes the matter all the more significant is that it is not only civilians, but officers of the sea service who are involved. Whether the scandals are to be regarded as one of the results of the progress of Western civilization is a nice matter for discussion. The people of Japan were evidently as much taken aback by the revelations as foreigners were, and hence the riots and the action of the two Houses of Parliament. Whatever may be the outcome of the business, it is certain that the navy of Japan will suffer not a little in prestige.—*Naval and Military Record.*

PENDING TRIAL OF NAVAL OFFICERS.—The preliminary investigation into the charge against Rear Admiral Fujii and Captains Agaki and Suyuki, in connection with the naval scandals, has been concluded. Vice-Admiral Matsuo, who is in custody in Tokio gaol in connection with the Mitsui case, is reported to have been examined as a witness once or twice during the last few days.

The judges of the court-martial will be appointed when Mr. Uchida, the procurator for courts-martial, presents his report to the Ministry of Marine. The authorities concerned declare that the trial of the case has not been and will not be affected in any way by the change in the Ministry of Marine. It is expected that Vice Admiral Shimamur, the newly-appointed Superintendent of Naval Education, will be appointed chief judge, and Rear Admiral Namaguchi, Director of Personal Affairs; Rear Admiral Suzuki, Director of Naval Affairs, and Captain Oguri associate judges for the court-martial.—Reuter.—*Naval and Military Record.*

A JAPANESE SUBSIDY.—While the United States Congress is threatening to deal our coastwise shipping (the only merchant marine we now have) a heavy blow in the repeal of the exemption clause of the Panama Canal Act the Japanese Government is making arrangements to grant a subsidy to the Japanese Steamship Company to enable it to profitably run a new line of vessels through the Panama Canal which will give a service from Japanese to the Gulf and Atlantic coasts of the United States, not now reached by any Japanese vessels. This is only one of several instances where foreign governments are preparing to give their shipping the needed protection against the competition it will have to meet through that waterway, and which is going to result in enabling such to shoulder American ships out of the canal altogether, unless our government condescends to give like protection to vessels under the American flag, but of which there is very slight prospect at present.—*Marine Journal.*

AEROPLANE MOTORS FOR JAPAN.—That Japan is trying to place an order for 250 motors for use in naval aeroplanes was the statement made by T. A. Ross and J. Stuart Burns, of England, who arrived in New York city recently, the *New York Sun* reports, to organize an American corporation to sell the Austro-Daimler motor in this country. Three Japanese naval officers came to the Daimler factory in Dumfries a few weeks ago, according to the Englishmen. They were informed that the Daimler factory could not turn out 250 motors of 250 horse-power each in twelve months, the time limit set by the Japanese. They were advised to try motor factories in Vienna. Japan was willing to pay a large price to get delivery in the specified time. Thomas Sopwith is building two aeroplanes for the British Navy, they said, each of which will carry three passengers, two machine guns and half a ton of ammunition in addition to the fuel for the 25 horse-power motor.—*Army and Navy Journal.*

MEXICO

THE MEXICAN NAVY.—Mexico is not entirely devoid of a navy. In fact, she possesses seven fighting ships, possibly four or five transports, and, for harbor service, she has three old schooners built by that Laird firm which was responsible for the armed cruisers which gave the North so much trouble during our civil war. The largest vessels of her little fleet are two cruiser transports, the *General Guerrero* and the *Progresso*. These are modern ships, the first built by Vickers, Maxim, in 1908, and the second by Odero, in 1907. The *General Guerrero* is a vessel of 1880 tons, armed with six 4-inch guns and two 3-pounders. Her engines of 1200 horse-power give the ship a speed of 12 knots. The *Progresso*, of 1690 tons, is a single-screw ship of 14 knots, armed with four 4-inch rapid-fire guns.

Next in size to these are four gunboats. The *Bravo* and *Morales*, built by Orlando, in 1903, are sister ships of 1200 tons displacement, carrying a complement of 150 officers and men. They were designed to steam at 16 knots with 2600 horse-power, and each is armed with two 4-inch rapid-fire guns, six 6-pounders, and with one 14-inch torpedo-tube carried above the waterline. These are twin-screw gunboats, and each carries about 200 tons of coal. The other two gunboats are the *Tampico* and the *Vera Cruz*, built in 1902 at Elizabethport, New Jersey. Each is of 980 tons displacement, and the complement of officers and men is 98. They can steam 16 knots with 2400 horse-power, and the armament consists of two 4-inch rapid-fire guns and six 6-pounders, with one 14-inch torpedo-tube in the bow above the water.

The other vessels are obsolete, the most important being the *Zaragoza*, built in 1891, and rebuilt in 1910. She is of 1200 tons displacement and steams at a speed of 15.5 knots. Her armament consists of six 4.7-inch, rapid-fire, Schneider-Canet guns. The navy is also credited with a transport, the *Oaxaco*, and possibly three or four others. The harbor service vessels are quite negligible, being nearly forty years old.—*Scientific American.*

NORWAY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruisers					
Bjorgvin.....	5000	16.5	2 9.4 in., 4 6-in., 6 4-in.	Messrs. Armstrong	Laid down Jan. 8, 1913
Nidaros.....	5000	16.5	same	same	" 1913

NOTE.—Norway has four submarines under construction.

The Norwegian naval budget for 1915 provides for the total expenditure of about £420,000. It provides the first instalment for the construction of a mine-layer and an unstated number of submarines, and authorizes the acquisition of two aeroplanes. It has also been decided to extend the equipment of the dockyard at Horten so that the construction of submarines may be undertaken there.

RUSSIA

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol	23,026	23	12 12-in., 16 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk.	23,026	23	same	" "	" Sept. 9, 1911
Poltava	23,026	23	same	New Admiralty	" July 10, 1911
Gangut	23,026	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	22,435	21	12 12-in., 20 4.7-in.	Nikolaieff	" Apr., 1914
Empress Marie	22,435	21	same	Ivan Bunge Co.	" Nov. 3, 1913
Catherine II...	22,435	21	same	" " "	Laid down Sept. 1, 1912
Battle Cruisers					
Ismailia.....	32,200	28	12 14-in., 21 5.1-in.	Galerni	" Dec. 19, 1912
Kinburn.....	32,200	28	same	Baltic Works	same
Borodino.....	32,200	28	same	Galerni	same
Navarino.....	32,200	28	same	Baltic Works	same
Small Cruisers					
Adm. Butakow	7,500	32	15 5.1-in.	Putilow, St. Petersb.	Laid down Nov. 29, 1913
Adm. Spiridov.	7,500	32	same	" "	" Nov. 29, 1913
Svietlana.....	7,500	32	same	Neval	" Dec. 7, 1913
Adm. Grieg....	7,500	32	same	"	" Dec. 7, 1913
Muravjev Amurski	4,500	..	8 5.1-in.	Elbing	Launched Apr. 11, 1914
Adm. Nevelskoj	4,500	..	same	"	Laid down Feb. 13, 1913
" Lazarev...	7,500	32	15 5.1-in.	N. F. & W. Nikolaieff	" Oct. 19, 1913
" Nachimow	7,500	32	.....	R. S. Co. "	same

NOTE.—Russia has about 45 destroyers and 19 submarines under construction or contract.

LIGHT CRUISERS.—The eight light cruisers authorized in the programme of June, 1912, are now in hand, and have been named. For the Black Sea, the combined companies at Nikolaieff are building two of 7600 tons, to be called the *Admiral Nakhimov* and *Admiral Lazarev*. Four of the same tonnage, three named after Admirals *Butakov, Spiridov,* and *Greig,* and one called the *Svietlana,* are building for the Baltic, the first two at the Putiloff yard and the others at Reval. All these six vessels will be armed with sixteen 5.1-inch guns. Two small cruisers of 4300 tons displacement, the *Admiral Nevelskoi* and *Muraviev Amurski,* are building at Elbing by Messrs. Schichau.

RUSSIAN AIR FLEET.—The Russian Government has drawn up a programme which provides that orders shall be placed for 330 aeroplanes, including 90 Sikorsky monoplanes and biplanes of the ordinary size and 10 giant Sikorsky machines of the type of the *Ilya Mouromets.* For the small aeroplanes other than those of the Sikorsky pattern, recourse will be had to foreign types, such as the *Farman, Deperdussin, Morane-Saulnier* and *Voisin.* Two aeroplanes will be ordered from the German firm of Rumpler and two from the English firm of Sopwith, and two will be constructed on

the system of the Russian Lieutenant Kowanko. Besides these aeroplanes, two dirigible airships will be ordered in France and one in Russia. The programme will be completed by the autumn.—*Scientific American.*

NEW ORDNANCE FACTORY.—The new Russian Artillery Works Company has now been definitely formed. The capital of the company is to be 25,000,000 roubles, a large share of which is held by Vickers Limited, who promoted the enterprise. The works are to be situated at Tzaritsen, on the river Volga, and will cover a very large site with an extensive river frontage. Vickers Limited have undertaken to build and equip the works and have them completed by September, 1915. Their contract with the Russian Government is of 15 years' duration, and it is expected that when the works get into proper working order the establishment will prove to be one of the largest ordnance factories in Europe.—*The Engineer.*

DUMA'S VOTE FOR EXTENSION.—The Imperial Duma has voted credits of £1,003,351 for building operations at the naval ports, the equipment of workshops there, and the building of dry docks, as well as under definite conditions credits of £7,775,054 for the building of warships and equipment of naval workshops for the year 1914 in connection with the five years' shipbuilding programme.—*Reuter.*

SPAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Espana.....	15,450	19.5	8 12-in., 20 4-in.	Ferrol	Commiss'd Oct. 23, 1913
Alfonso XIII..	15,450	19.5	same	"	Launched May 7, 1913
Jaime I.....	15,450	19.5	same	"	Laid down Feb. 5, 1912

SWEDEN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Small Cruiser					
Sverige.....	7100	22.5	4 11-in., 8 5.4-in.	Gothenburg	Laid down Feb. 15, 1913

TURKEY

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Reschadieh.....	23,500	21	10 13.5-in., 16 6-in.	Vickers, Barrow	Launched Sept. 3, 1913
Birindje Osman.	27,500	22	14 12-in., 20 6-in.	Armstrong	Launched Jan. 22, 1913, in Rio de Janeiro

UNITED STATES

VESSELS BUILDING

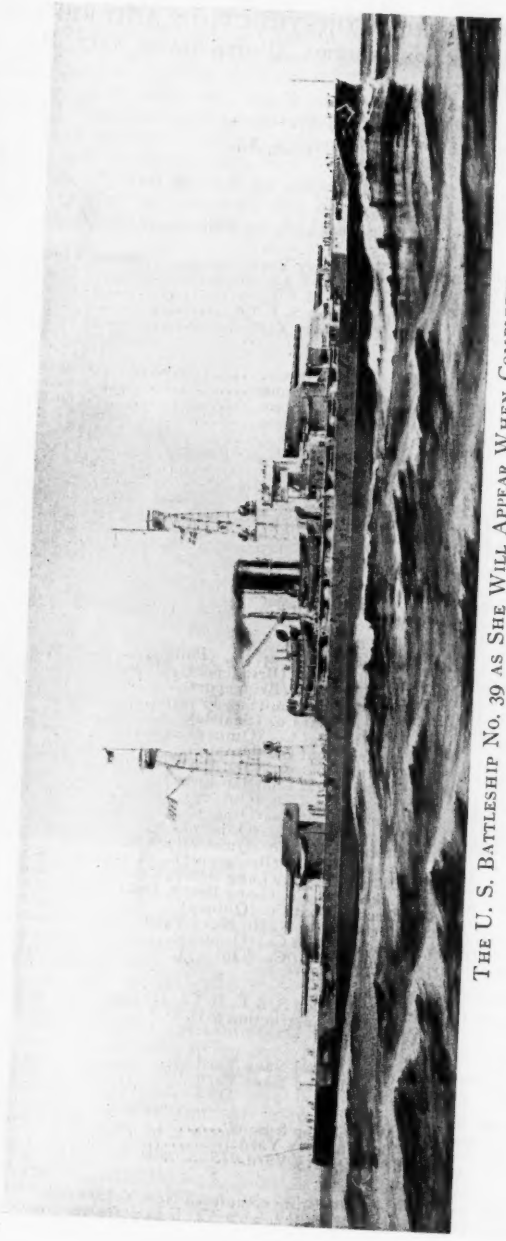
Number	Name	Displacement	Speed	Armament	Where Building	Remarks
	Battleships					
34	New York....	27,000	21	10 14-in., 21 5-in., 4 t. t.	N. Y. Navy Yard	Commissioned
36	Nevada.....	27,500	20.5	same	Quincy	Laid Down Oct. 26, '12
37	Oklahoma....	27,500	20.5	same	Camden	" " Nov. 4, '12
38	Pennsylvania	31,400	21	12 14-in., 22 5-in., 4 t. t.	Newport News	" " May —, '12
39	....	31,400	21	same	N. Y. Navy Yard	....

U. S. BATTLESHIP "No. 39."—The keel of Battleship *No. 39*, authorized March 4, 1913, was laid down at the Brooklyn Navy Yard March 16. *No. 39* will, in all essential particulars, be a duplicate of the *Pennsylvania*, now under construction at Newport News, except as regards propelling machinery. *No. 39* will be fitted with Parsons' steam turbines and her general dimensions and features are as follows: Length on designer's waterline, 600 feet; length over all, 608 feet; breadth, extreme, at designer's waterline, 97 feet ½ inch; mean trial displacement, 31,400 tons; mean draft to bottom of keel at trial displacement (about) 28 feet 10 inches; total fuel oil storage, 2322 tons; fuel oil carried on trial, 1548 tons; feed water carried on trial, 209 tons; speed on trial, not less than 21 knots. Armament: Main battery—twelve 14-inch 45-caliber breech loading rifles and four submerged torpedo-tubes. Secondary battery—twenty-two 5-inch 51-caliber rapid-fire guns, four 3-pounder saluting guns, two 1-pounder guns for boats, two 3-inch field pieces and two machine guns. Plans prescribe two triple-gun turrets forward and two aft on center line, guns of the rear turret in each case firing over the top of the turret in front. *No. 39* will have two cage masts, a single funnel and two derricks or cranes with a swinging arm for the lowering and hoisting in of boats. The main armor belt will be 16 inches thick. The drawing of this battleship reproduced herewith was supplied by Chief Constructor R. M. Watt, U. S. N.—*Shipping Illustrated.*

"TEXAS" AND "IRON DUKE."—The British battleship *Iron Duke* and the U. S. S. *Texas* were commissioned on the 10th and 12th of March, respectively. The following is a comparison of the two ships:

	Iron Duke	*Texas*
Laid down	15th Jan., 1912	17th April, 1911
Time to build	26 months	35 months
Length	580 feet	565 feet
Beam	90 feet	95 feet 2½ inches
Displacement	25,000 tons	27,000 tons
Horse-power	29,000	28,100 tons
Speed, designed	21 knots	21 knots
Main belt	12 inches	12 inches
Principal guns	ten 13.5-inch, twelve 6-inch	ten 14-inch twenty-one 5-inch
Fuel: Coal	2700 tons	2850 tons
Oil	1000 tons	400 tons

The weight of the heavy-gun projectile is the same in both cases—1400 pounds.



THE U. S. BATTLESHIP NO. 39 AS SHE WILL APPEAR WHEN COMPLETED

NAVY DEPARTMENT
BUREAU OF CONSTRUCTION AND REPAIR
VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY, MAY 11, 1914

Name, type and no. of vessels	Contractor	Per cent of completion May 1, 1914		Apr. 1, 1914	
		Total	Per cent on ship	Total	Per cent on ship
Battleships					
34 New York	New York Navy Yard ....Commiss'd April 15, 1914	99.5	99.5		
36 Nevada	Fore River S. B. Co.	63.9	53.3	61.3	49.0
37 Oklahoma	New York S. B. Co.	67.2	63.9	65.3	61.7
38 Pennsylvania	Newport News S. B. Co.	29.1	19.9	23.7	16.4
39	New York Navy Yard	11.5	.....	8.8	.....
Destroyers					
45 Downes	New York S. B. Co.	95.3	95.3	95.1	95.1
51 O'Brien	Wm. Cramp & Sons.	62.2	57.9	55.1	51.4
52 Nicholson	Wm. Cramp & Sons.	60.5	55.8	53.5	49.3
53 Winslow	Wm. Cramp & Sons.	54.4	49.0	49.4	44.4
54 McDougal	Bath Iron Works	89.3	88.6	85.4	84.3
55 Cushing	Fore River S. B. Co.	41.5	35.8	38.1	32.5
56 Ericsson	New York S. B. Co.	61.6	60.6	53.7	51.5
57 Tucker	Fore River S. B. Co.	9.4	.....	8.3	.....
58 Conyngham	Wm. Cramp & Sons.	6.8	.....	5.4	.....
59 Porter	Wm. Cramp & Sons.	6.7	.....	5.2	.....
60 Wadsworth	Bath Iron Works.	17.5	.....	13.9	.....
61 Jacob Jones	New York S. B. Co.	9.8	.....	9.5	.....
62 Wainwright	New York S. B. Co.	9.8	.....	9.5	.....
Destroyer Tenders					
2 Melville	New York S. B. Co.	47.3	45.6	41.5	39.7
Submarines					
26 G-4†	American Laurenti Co. (Phila.)	96.4	95.5	96.4	95.5
27 G-2*	Lake T. B. Co. (Bridgeport).	89.7	89.7	89.7	89.7
31 G-3*	Lake T. B. Co. (Bridgeport)	81.6	81.3	81.6	81.3
34 K-3	Electric Boat Co. (San Fran.)	94.0	94.0	94.0	94.0
35 K-4	Electric Boat Co. (Seattle)	93.9	93.4	92.7	92.0
36 K-5	Electric Boat Co. (Quincy)	92.8	92.8	92.0	92.0
37 K-6	Electric Boat Co. (Quincy)	92.8	92.8	92.0	92.0
38 K-7	Electric Boat Co. (San Fran.)	88.9	87.6	86.2	84.9
39 K-8	Electric Boat Co. (San Fran.)	88.4	87.1	85.1	83.8
40 L-1	Electric Boat Co. (Quincy)	30.3	25.1	26.4	22.6
41 L-2	Electric Boat Co. (Quincy)	30.3	25.1	26.4	22.6
42 L-3	Electric Boat Co. (Quincy)	30.3	25.1	26.3	22.5
43 L-4	Electric Boat Co. (Quincy)	30.2	25.0	26.4	22.6
44 L-5	Lake T. B. Co. (Bridgeport)	8.1	4.6	7.4	4.2
45 L-6	Lake T. B. Co. (Long Beach, Cal.)	0.0	0.0	0.0	0.0
46 L-7	Lake T. B. Co. (Long Beach, Cal.)	0.0	0.0	0.0	0.0
47 M-1	Electric Boat Co. (Quincy)	20.8	16.8	17.8	13.7
48 L-8	Portsmouth, N. H., Navy Yard	0.0	.....	.....	.....
49 L-9	Electric Boat Co. (Quincy)	1.9	.....	0.0	.....
50 L-10	Electric Boat Co. (Quincy)	1.9	.....	0.0	.....
Submarine Tenders					
1 Fulton	New London S. & E. B. Co. (Quincy)	62.3	59.2	53.1	48.1
2 Bushnell	Seattle Construction & D. D. Co.	33.6	.....	28.2	.....
Fuel Ships					
13 Kanawha	Mare Island Navy Yard	49.0	47.6	43.8	41.1
14 Maumee	Mare Island Navy Yard	25.9	20.7	24.2	18.6
Miscellaneous					
G. B. 19 Sacramento	Wm. Cramp & Sons....Del'v'd April 26, 1914	92.7	92.7		
Supply Ship No. 1	Boston Navy Yard	0.0	.....	0.0	.....
Transport No. 1	Phila. Navy Yard	0.0	.....	0.0	.....

*Contracts forfeited, vessels being completed New York Yard.
†Conditionally delivered at Philadelphia Yard, January 22, 1914.

LAUNCH OF THE "OKLAHOMA."—The U. S. Battleship *Oklahoma*, one of the two capital ships authorized by Congress, March 4, 1911, was launched by the New York Shipbuilding Co., at Camden, N. J. The dimensions of the ship are: Length over all, 583 feet; length on designer's water-line, 575 feet; breadth on load water-line, 95 feet 2½ inches; mean draft, 28 feet 6 inches; displacement, with two-thirds stores and fuel and complete ammunition, 27,500 tons; full load displacement, 28,400 tons; contract speed, 20½ knots; bunker capacity, 598,400 gallons of oil (2000 tons). The *Oklahoma* is the first battleship launched for the U. S. Navy which will burn oil fuel exclusively and she will be propelled by triple-expansion four-cylinder engines driving twin screws and having cylinders 35 inches, 59 inches and 78 inches (2), by 48-inch stroke, taking steam from 12 B. & W.

THE U. S. S. "OKLAHOMA" TAKING THE WATER

boilers having 48,000 square feet of heating surface. The total horse-power developed by main engines is estimated at 24,800 and the weight of the propelling machinery is about 1900 tons. For working the guns, lighting and other purposes there will be installed four turbo-generating sets of 300 K. W., giving a total of 9600 amperes. The main offensive armament will consist of ten 14-inch 45-caliber guns mounted in line of keel in four turrets, Nos. 2 and 3, with two guns each firing over Nos. 1 and 4 with three guns each. The secondary battery will consist of twenty-one 5-inch 51-caliber guns and, for saluting purposes, there will be mounted four 3-pounders. The torpedo-tubes will number four of 21-inch diameter, all submerged. The armor defence will include a main belt 17.5 feet wide and 13.5 inches thick, for about 480 feet of the length, tapering to 8.5 feet width at the aftermost 50 feet and in thickness to 8 inches at bottom edge; the bulkheads will be plated with armor from 13.5 inches to 8 inches, the fronts of 3-gun turrets with 18-inch armor, those of 2-gun turrets with 16-inch armor, the turrets' sides with 10-inch to 9-inch armor and 5-inch tops. On deck cloping

there will be 2 inch to 1.5 inch protection, 3 inch on armored maindeck, 18.5-inch armor on barbettes and 16 inch on conning-tower and tubes. The *Oklahoma* is the first U. S. battleship launched which will have only one funnel. There will be two cage masts carrying the usual spotters' platforms and the crew complement will include 55 officers and 808 men. The ship is to be delivered to the government on January 22, 1915. The keel was laid October 26, 1912, so that she has been some 17 months on the builders' blocks.—*Shipping Illustrated.*

U. S. S. "AYLWIN," "PARKER" AND "BENHAM."—The construction of eight torpedo-boat destroyers, Nos. 43 to 50, inclusive, was authorized by an Act of Congress approved March 4, 1911, of which the *Aylwin* is No. 47, the *Parker* is No. 48, and the *Benham* is No. 49.

These vessels were built under contract by the William Cramp and Sons Ship and Engine Building Company of Philadelphia, Pa., the contract speed being 29.5 knots, the trial displacement 1036 tons and the price of each vessel $756,100. The time of completion for the *Aylwin* was twenty-two and one-half months; for the *Parker*, twenty-three months, and for the *Benham*, twenty-three and one-half months from the date of contract.

These are twin-screw vessels with combinations of turbines and reciprocating engines. The turbines are of the Cramp-Zoelly type, to be used when speeds greater than 17 knots are desired. For cruising speeds below 17 knots there is on each shaft a reciprocating engine.

Hull

Principal dimensions:

Length on L. W. L., feet and inches	300-00
over all, feet and inches	305-03
Breadth, extreme at L. W. L., feet and inches	30-04
Ratio of length to beam	10.004
Draft to L. W. L., feet and inches	9-02½
Displacement corresponding, tons	1,010
per inch at L. W. L., tons	14.21
Area immersed midship section, square feet	190.0
Coefficient of fineness, block	0.415

The hull is of steel, galvanized in all parts below the water line. The vessel is of the raised-forecastle type, which is carried aft to frame No. 46. On the forecastle deck are located the anchors, capstan and pilot house, with flying bridge. A search-light is carried on a raised platform above the bridge.

Aft of frame No. 46 the main deck is a weather deck. From forward aft on this deck are located storeroom, lamp room, wardroom officers' quarters, wardroom, pantry and galley. Aft, in a deck house, are located hatch trunk to crew's quarters, wireless room and crew's water closets. A search-light is carried on top of this house. There are two masts equipped with wireless outfit and signal yards.

The berth deck is divided into two parts. It extends from the stem to frame No. 48 and from frame No. 134 aft, the space between being used for deep fuel-oil tanks, cofferdam, firerooms and engine rooms. Forward are located a storeroom, paint and oil room and crew's quarters, and aft are crew's and petty officer's quarters and storerooms.

In the hold are located trimming tanks, chain lockers, storerooms, ammunition and handling rooms, fuel-oil tanks, cofferdam (extending to the main deck and designed to be used as a reserve-feed tank), boiler and engine rooms, oil tanks, ammunition and handling rooms and after trimming tanks. Reserve-feed and fresh-water tanks are located abreast boilers No. 2 and 3. An engineer's storeroom is carried over the fresh-water tank on the starboard side and over the reserve-feed tank on the port side. Coal for galley use is carried in a small bunker located in the port forward corner of No. 1 fireroom

Battery

Four 4-inch R. F. guns.

Four 5.2-m. by 45-cm. twin torpedo tubes.

The 4-inch R. F. guns are located as follows: One on the forecastle-deck center line, commanding ahead and broadside fire; one starboard and one port, at the break of the forecastle; and one well aft on the main-deck center line.

The torpedo tubes are located on the main deck. One is on the port side above frame No. 74 and one on the starboard side over frame No. 95. The remaining two are abreast one another over frame No. 116.

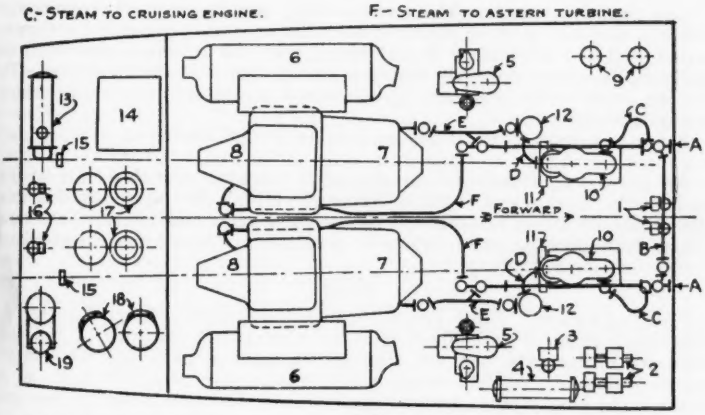
Main Engines

The propelling units are two Cramp-Zoelley turbines and two compound reciprocating engines.

U. S. S. PARKER.

DIAGRAM ARRANGEMENT OF MACHINERY IN ENGINE ROOM.

A.- MAIN STEAM FROM BOILERS
B.- MAIN STEAM CROSS CONNECTION.
C.- STEAM TO CRUISING ENGINE.
D.- EXHAUST FROM CRUISING ENGINE.
E.- STEAM TO AHEAD TURBINE.
F.- STEAM TO ASTERN TURBINE.



1. LUBRICATING OIL PUMP.
2. TURBO GENERATOR.
3. OIL COOLER CIRCULATING PUMP.
4. OIL COOLER.
5. MAIN CIRCULATING PUMP AND ENGINE.
6. MAIN CONDENSER.
7. AHEAD TURBINE.
8. ASTERN TURBINE.
9. MAIN FEED PUMPS.
10. RECIPROCATING CRUISING ENGINE.
11. FRICTION CLUTCH.
12. REHEATER.
13. AUX. CONDENSER, COMB. AIR & CIRC. PUMP.
14. FEED AND FILTER TANK.
15. TORSIONMETERS.
16. FIRE AND BILGE PUMPS.
17. MAIN AIR PUMPS.
18. EVAPORATOR PLANT.
19. AIR COMPRESSOR

FIG. 1.

The turbines are of the compound impulse type arranged on two shafts and designed to develop 16,000 S. H. P. at about 620 revolutions per minute. The reciprocating engines, two in number, are of the vertical, inverted, two-cylinder, compound type located just forward of the turbines. These are brought into use by means of a power-controlled clutch of the friction

type. This clutch is so designed that the engines are capable of being connected or disconnected without slowing down, and is interlocked with the maneuvering valves so that steam cannot be admitted to the ahead or astern turbines until the reciprocating engines are disconnected. There is also fitted a governor valve, which secures the reciprocating engine from running away in case the clutch should become disconnected.

The turbines consist of two essential parts: the fixed part or casing and the moving part or rotor. Within the casing are secured the fixed diaphragm plates, the intermediate-guide blades and the expanding-guide blades, and on the rotor are secured the discs and drum carrying the moving blades. The rotor is supported at the forward and after ends of the casing by bearings secured thereto.

The ahead and astern turbines, with the exhaust belt between them, are within one casing of cast iron. This casing is divided along its horizontal axis so that its upper halves of the ahead, astern and exhaust belts may be removed in one operation for purposes of inspection or repair.

Full Speed Ahead.—Steam at full pressure is admitted to the full-head chest and allowed to expand through all the stages of the turbines until finally exhausted into the condensers. The astern turbines under these conditions are running idly in a vacuum.

High Cruising Speeds.—At these speeds the steam is admitted to the intermediate-ahead chest, throttled to suitable pressure, and passes through the same paths as under full-speed conditions.

Low Cruising Speeds.—The reciprocating engines are used in connection with the turbines at these speeds. Steam is expanded through the reciprocating unit from which it is exhausted into the reheater, thence to the intermediate-ahead chest, through the turbines and into the condenser. The heating agent in the reheaters is the exhaust steam from the reciprocating-engine cylinder jackets.

For astern motion at all speeds the astern turbines alone are used and for maneuvering the turbines units only are in use.

An interesting feature of the design of machinery in this class of boat built at the Cramp's yard is the "change valve." By means of this valve the supply of steam to either of or both the main and intermediate-ahead chests in the interests of economy or regulation of speed, may be regulated.

Boilers

Four oil-burning White-Forster water-tube boilers, designed to run the machinery plant at full power with an average air pressure of not more than six inches of water, are arranged in pairs in two separate compartments. Each boiler has independent smoke pipe provided with an air space. The smoke pipes are of oval cross-section of 16.57 square feet area, and are 30.05 feet in height above the oil burners.

Data for One Boiler

Working pressure, pounds	260
Test pressure, pounds	390
Number of furnaces	1
Furnace volume, cubic feet	452
Oil burners, number	11
type	Schutte-Koerting.
Heating surface, square feet	5,400
External height, feet and inches	12–07 7/8
width, feet and inches	14–07 3/4
length, feet and inches	13–02 1/8
Tubes, number	3,256
outside diameter, inch	01
thickness, B. W. G.	13
length, mean, exposed, feet	6.34

Down comers, number	2
inside diameter, inches	08⅛
thickness, inch	00⅜
Drum, upper, number	1
inside diameter, inches	48
thickness shell, inch	00 9/16
tube sheet, inches	01 9/16
lower, number	2
inside diameter, inches.....long, 30; short	19½
thickness shell, inch	00 9/16
tube sheet, inches	01 9/16
Diameter of main steam stop valve, inches	07
auxiliary steam stop valve, inches	04
safety valves, inches (two duplex Ashton)	04
main and auxiliary feed, stop and check valves, in.	03
bottom-blow valves, inches	01½
surface-blow valve, inches	01¼

Fuel-oil System

The fuel-oil pumps and heaters are located in the forward and after fire-rooms as shown in Fig. 2.

The plant consists of two light-service booster pumps, four heavy-service supply pumps, two oil heaters, and the oil-storage tanks in the forward and after holds, with the necessary pipes and fittings.

The booster pumps have suctions from all storage tanks and the deck connections for taking on oil, and discharge to all storage tanks, supply-pump suctions and to deck connections. There are also connections to these pumps to draw the water which has settled in the oil tanks and discharge it overboard.

The service pumps draw oil from the storage tanks and the booster pumps' discharges, and deliver it to the burners *via* the oil heaters or by-passes. The burners, eleven to each boiler, are of the Schutte-Koerting mechanical atomizing type. Strainers are fitted in the pump suctions and discharges, and the supply pipes to burners are provided with cocks controlled from both the fireroom and deck.

For raising steam when no air pressure is available, there is provided in each fireroom a small hand pump designed to deliver oil to two burners at about 200 pounds pressure.

TORSIONMETERS

An improved type of Gary-Cummings torsionmeter is provided for each line of shafting, for ascertaining the shaft horse-power developed at the various speeds.

Trials

The contract trials were as follows:

(*a*) A progressive trial over the measured-mile course, for standardizing the screws.

(*b*) A full-speed trial of four hours duration in the open sea, in deep water, at the highest speed attainable, the average speed to be not less than 29.5 knots, with the average air pressure in the firerooms not exceeding 6 inches of water and the steam pressure at the high-pressure turbine not to exceed 240 pounds above the atmosphere.

(*c*) A fuel-oil and water-consumption trial of four hours duration in the open sea at an average uniform speed of 24 knots as nearly as possible.

(*d*) A fuel-oil and water-consumption trial of four hours duration in the open sea at an average speed of 15½ knots as nearly as possible. This

FIG. 2.

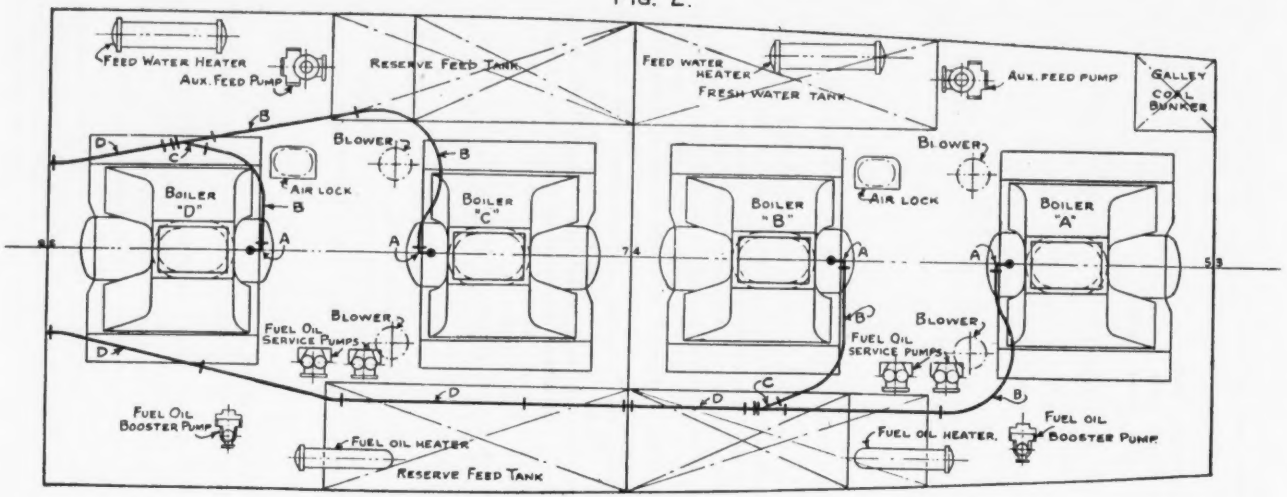


DIAGRAM ARRANGEMENT OF MACHINERY IN FIRE ROOM
U.S.S. PARKER

A – 7" MAIN BOILER STOP VALVE.
B – 7" MAIN STEAM FROM BOILER.
C – 9½" × 7" × 7" EXPANSION JOINT.
D – 9½" MAIN STEAM LINES.
E – 9½" STUFFING BOX.

trial to be made as nearly as possible under service conditions, with the cruising engines connected up and in use.

(*e*) An endurance trial of twenty hours duration in the open sea at an average speed of 15½ knots as nearly as possible, under service cruising conditions, with cruising engines connected up and in use.

(*f*) A fuel-oil and water-consumption trial of four hours duration in the open sea with the cruising engines connected up and in use, at an average speed of 12 knots as nearly as possible.

The standardization trials were run over the measured mile off the Delaware Breakwater. On each vessel twenty-six runs were made over the course, the data from which were used in plotting the curves shown in Figures 3, 4 and 5. An example of this data, for the *Parker*, is shown in Table 3.

It was determined from the official speed and revolution curves that the following revolutions per minute were required to obtain the contract speeds on the endurance trials:

Speed, in knots	U. S. S. Parker R. p. m.	U. S. S. Aylwin R. p. m.	U. S. S. Benham R. p. m.
12	198.6	201.4	191.1
15.5	256.0	258.7	250.8
24	418.8	419.8	417.7
29.5	581.3	577.8	584.0

The endurance trials were run in the open sea off the Delaware Capes. —*Journal Ass. Amer. Naval Eng.*, by J. S. McKinney.

"McDOUGAL."—The torpedo-boat destroyer *McDougal* was launched at Bath, Me., April 22. She will be ready for the official acceptance trials early next month and must average 30½ knots an hour.—*Shipping Illustrated.*

DOCKING SUBMARINES.—It has been decided to dock the U. S. submarines *C 1, C 2, C 3, C 4,* and *C 5*, which have been stationed at the Atlantic entrance to the Panama Canal since December 12, 1913, in the upper level of the east flight of Gatun Locks. It is estimated that about three weeks will be required for their overhauling. The overhauling includes taking off and replacing manhole plates on ballast and fuel tanks; testing the hull, fuel tanks, and ballast tanks to air pressures of 10, 15, and 50 pounds, respectively, renewing rivets if necessary and making the plates airtight to the respective pressures; cleaning ballast tanks and painting them with two coats of anticorrosive paint; providing a water pump or other device capable of giving a water pressure of 3000 pounds to the square inch, for testing the high pressure air service; and, on submarine *C 4*, lining up the diving rudder bearings, and, by swinging the diving rudder in a lathe, line up its journals.—*Shipping Illustrated.*

Secretary Daniels has decided to build one of the submarines authorized at the last session of Congress at the Portsmouth, N. H., Navy Yard, under plans of the Lake Torpedo-Boat Co.—*Shipping Illustrated.*

GUNBOATS FOR CHINESE WATERS.—Two light draft gunboats for the U. S. Navy to be put together at Shanghai, will be named *Monocacy* and *Palos*. Sections of the hulls and other fittings have been shipped to Shanghai and will be put together under the direction of Naval Constructor L. S. Border. The new river gunboats are constructed to penetrate to the fathest trading outposts in the interior of China. Fitted with small but powerful engines, they are capable of a fair speed, and have capacity for carrying a number of men and supplies in time of emergency.—*Shipping Illustrated.*

D— 9½" MAIN STEAM LINES.
E— 9½" STUFFING BOX.

AVAILABLE AUXILIARIES FOR THE NAVY.—The precipitation of hostilities in Mexico recently has resulted in the chartering of the steamers *Morro Castle* and *Mexico* of the Ward Line as transports in addition to the *Esperanza,* which was taken over previously by the government. In this connection it is interesting to note that reports from Philadelphia state that there are 20 merchant vessels hailing from there available if needed for government transports, colliers, supply ships and general cargo carriers. The U. S. Naval Board of Inspection of Merchant Vessels has been busy for the last six months seeking out available craft at all American ports. The steamers of the Ward Line mentioned above, as well as those of the American Line, were built under the Postal Subsidy Act of 1891 with the understanding that they should be available to the government whenever occasion arises.—*Marine Journal.*

CONTRACTS FOR NEW VESSELS AND REPAIR WORK FOR MERCANTILE AND NAVAL PURPOSES.—The resignation of Francis T. Bowles as president of the Fore River Shipbuilding Corporation did not take shipbuilding circles by surprise. When the Quincy plant came under the control of Charles M. Schwab last year, it was expected that sweeping changes in the management would soon take place. Quietly and unobtrusively, new blood is being injected into the organization, but time alone will tell whether this yard can ever be made a paying concern. The unfortunate contract with the Argentine Government for the construction of two battleships, which brought about the financial reorganization of the Fore River Co., is now in a fair way toward completion. The *Rivadavia* managed to "squeeze through" her acceptance trials, although she fell a slight fraction below the agenda speed (22½ knots) and her fuel economy fell by a small margin from the terms of the contract. She will probably be delivered toward the end of summer. Her consort, the *Moreno,* which the New York Shipbuilding Co. have on hand at Camden, N. J., is slowly approaching the trial stage. According to report, only about half of her twelve 12-inch guns are now in position. The delays and squabbles which have attended the construction of these two ships have not added to the prestige of the American shipbuilding industry abroad and their departure from these shores will bring relief to every one engaged in shipbuilding in this country.—*Shipping Illustrated.*

OUR ENLISTED MEN.—Out of 75,475 applicants for enlistment in the U. S. Navy during 1913, only 17,918 were accepted. This small percentage is evidence of very careful sifting by those in authority, insuring a high standard of character and efficiency in the men behind our guns.

ENLISTED PERSONNEL.—In reply to a request for information the Secretary of the Navy stated the following facts: On June 30, 1913, there were 48,068 enlisted men in the navy, and they were serving the following enlistments: Under tenth enlistment, 36; under ninth enlistment, 89; under eighth enlistment, 172; under seventh enlistment, 224; under sixth enlistment, 364; under fifth enlistment, 658; under fourth enlistment, 1385; under third enlistment, 4015; under second enlistment, 10,040; under first enlistment, 31,085; total, 48,068. This would seem to indicate that by far the greater percentage of men are not dissatisfied. The number of first enlistment men was then 64.67 per cent, and the balance of our enlisted personnel, 35.33 per cent, represented men who were serving the second or subsequent enlistments. You will observe that this percentage is one-third of the enlisted personnel enrolled. For the year ending June 30, 1912, we re-enlisted 54 per cent of the discharged men who, by virtue of their first enlistment records, would be allowed to re-enlist. For the year ending June 30 last the re-enlistments reached 57 per cent. Touching upon desertions, our records show that in 1909 they were nine per cent, and I am happy to inform you that there has been a steady and gradual decrease until now they are less than four per cent.—*Army and Navy Journal.*

NAVAL APPROPRIATION BILL.—The Naval Appropriation Bill as reported from the House Naval Committee carries $139,964,333.61, or $836,000 less than the bill of last year.

The building programme is as follows:

Two first-class battleships of the highest speed and largest possible radius of action, to rank among the world's dreadnoughts, $7,800,000 each, exclusive of armor and armament.

One powerful seagoing submarine, $1,100,000.

Six torpedo-boat destroyers, $925,000 each.

Three coast-defence submarines, $620,000; designed for use on the Pacific coast.

Four harbor-defence submarines of smaller type, $375,000 each; intended for use on the Gulf coast and at Panama.

The bill provides that the defence submarines shall be built and maintained on the Pacific coast, provided that they can be built there as cheaply as they can be built on the Atlantic coast "and laid down" on the Pacific coast.

An important provision in the bill is one which specifies that of the sums carried in the measure, except such amounts as may be required to meet obligations authorized in previous acts and for which contracts have been made, "no part shall be used to procure through purchase or contract any vessels, armament, articles, or materials which the navy yards, gun factories, or other individual plants operated by the Navy Department are equipped to supply, unless such government plants are operated approximately at their full capacity for not less than one regular shift each working day, except when contract costs are less than costs in said government plants and except when such government plants are unable to complete the work within the time required and except in cases of emergency."

Another new provision is that which authorizes the appointment to the Naval Academy as midshipmen of 25 enlisted men in one year. These enlisted men must have two years' service in the navy and pass a competitive examination on board ship, the requirements to be determined by the Secretary of the Navy. There will be no entrance examination in these cases.

The bill does not provide for a dry dock at either Norfolk or Philadelphia. This was to be expected, in view of the rivalry which has prevailed between the two places.

The Secretary of the Navy is authorized to select a site for an armor plant with the capacity of 20,000 tons and another site for a plant of 10,000 tons capacity and is directed to report to Congress on the subject at the beginning of the next regular session.

No welfare secretaries are included in the bill. In dealing with the question of the increase of chaplains there is a provision in the bill creating the grade of acting chaplains, to be appointed by the Secretary of the Navy with the rank, pay, and allowances of a lieutenant, junior grade. After three years' service an acting chaplain, before receiving a commission in the navy, shall establish to the satisfaction of the Secretary of the Navy, by the usual examination by a board of chaplains and medical officers of the navy, his physical, mental, and moral fitness to perform the duties of chaplain. He will be commissioned as chaplain in the navy with the rank of lieutenant, j. g. If an acting chaplain fails to pass the examination he shall be honorably discharged. Furthermore, the secretary is authorized to revoke the appointment of an acting chaplain at any time. The total number of chaplains and acting chaplains is fixed at one to each 1250 of the total personnel of the Navy and Marine Corps as fixed by law, including midshipmen, apprentice seamen, and naval prisoners. Ten per cent of the chaplains and acting chaplains shall have the rank of captain in the navy, 30 per cent that of commander, 20 per cent that of lieutenant commander, and the remainder that of lieutenant and lieutenant, j. g. Navy chaplains when commissioned under this law will have the rank and pay of lieutenants, j. g., until they have completed four years' service in that grade. They

will continue in the rank of lieutenant for four years, after which they may be promoted to lieutenant commander as vacancies occur. It is provided that not more than seven acting chaplains shall be commissioned in any one year.

There is a provision in the bill authorizing the secretary to enter into a contract for the use by the government of dry docks at Hunters Point, San Francisco, one of which shall be capable of docking the largest vessel that can be passed through the locks of the Panama Canal, for a period not exceeding six years at the rental of $50,000 a year.

The Bureau of Equipment is formally abolished, the appropriations being distributed as they have been during the last few years among other bureaus.

The limit of cost of the dry dock at Pearl Harbor is increased by $1,500,000. There is also appropriated for Pearl Harbor $70,000 of which $20,000 is to be used for four officers' quarters and $50,000 to complete the torpedo-boat slip.

Under the Bureau of Yards and Docks there is appropriated for maintenance, $1,600,000; as contingent funds, $50,000, an increase of $20,000. For the Boston Navy Yard, $22,000; unpledged balance of the appropriation for Boston Marine Barracks of $148,000 is reappropriated and made available for the installation of shipbuilding ways and the improvements of the yard. New York Navy Yard, $122,000 for miscellaneous improvements. Philadelphia Navy Yard, quay walls and piers, $50,000; power plant improvements, $15,000; building slips and equipment, $200,000; total, $265,000. Washington Navy Yard, fireproof general storehouse, $100,000, with a limit of cost of $225,000. Norfolk Navy Yard, repair to building at St. Helena, $25,000. It is provided that the 150-ton crane authorized by the act of March 4, 1913, shall be of a floating revolving type and the limit of cost is increased to $450,000. Charleston Navy Yard, to complete torpedo-boat berth (cost not exceeding $300,000), $150,000; dredging, $10,000; extension, $5,000; total, $170,000. Mare Island, to complete quay wall, $20,000; modernizing electric plant, $10,000; improvement of hydraulics, Mare Island Straits, and for other purposes, $207,000, to be available until expended. Puget Sound Navy Yard, to complete shipfitters and structural steel storage, $155,000. Narragansett Naval Station, $10,000. Guantanamo Naval Station, quarters for civilian employees, $8,000; recreation building for enlisted men, $20,000.

Naval Academy, to complete construction of wharf and approach, $75,000. Naval Proving Ground, Indian Head, Md., $500,000 toward the extension of powder factory.

Depots for Coal and Other Fuel.—For additional fuel oil storage, Melville, R. I., $20,000; fuel oil storage, Norfolk, $150,000; fuel oil storage, San Diego, Cal., $50,000; steel coaling tower, San Diego, Cal., $45,000; fuel oil storage, Puget Sound, $105,000; contingent, $30,000; in all, $400,000.

Newport Torpedo Station, one assembly shop, $100,000; one torpedo storehouse, $85,000; machine shop, $75,000; total, $260,000.

For repairs and preservation at navy yards and stations, $1,100,000 is allotted, against $800,000 appropriated last year. The contingent fund of the navy for emergencies is increased from $46,000 appropriated last year to $150,000 this year. An allowance of $104,000 is made for the entertaining of officers and crews of foreign fleets which may be sent to attend the Panama-Pacific Exposition at San Francisco. This sum is made available until November 15, 1915. To further encourage the exposition it is provided in the bill that tolls of the Panama Canal shall not be assessed against any foreign vessel which may be en route to or returning from the exposition, when such vessel has been sent by its government to participate in the exposition.

There is a provision in the bill by which money derived from the sale of material at the Naval Home originally purchased from money appropriated from the income from the naval pension fund, and also all rent of

Naval Home property, shall be turned over to the naval pension fund. It is also provided that money belonging to a deceased beneficiary of the Naval Home or derived from the sale of his personal effects not claimed by the legal heirs shall be deposited with the pay officers of the Naval Home, and if any sum so deposited shall be unclaimed for a period of three years it shall be deposited with the treasury fund.

Other important items in the bill are as follows:

Bureau of Navigation.—Transportation, $850,000; recruiting, $130,000; contingencies, $15,000; gunnery exercises, $100,000; steaming exercises, $6,500; aviation, $10,000; outfits, $800,000; naval auxiliaries, $800,000; instruments, $30,000; surveys, $90,000.

Naval Training Stations.—California, $70,000; Newport, $85,000; Chicago, $98,447; Norfolk, $25,000.

Naval War College, $28,850; Naval Home, $22,696; do., maintenance, $77,117.

Bureau of Ordnance.—Ordnance, $5,800,000 (with a provision authorizing the secretary to make emergency purchase of ordnance material abroad to be admitted free of duty); smokeless powder, $1,150,000 (at 58 cents a pound, none to be purchased unless the government powder factory shall be operated at full capacity); naval gun factory, $75,000; renewing breech mechanisms, $75,000; replacing guns, $150,000; liners, $100,000; modifying 5-inch guns, $65,000; ammunition for ships, $3,178,890; torpedoes, $1,000,000; torpedo station, $80,000; machinery for do., $15,000; ordnance experiments, $150,000; arming militia, $125,000; repairs, $30,000; contingent, $9500.

Medical Department.—Stores, $510,000; contingent, $142,000; transportation of remains, $15,000.

Supplies and Accounts.—Pay of Navy, $40,010,724; provisions, $7,713,954; maintenance, $2,031,481; freight, $525,000; coal and transportation. $4,800,000.

Construction and Repair.—$0,788,000; improvements of plants at Portsmouth, Boston, and Puget Sound, $10,000 each; same at New York, Philadelphia, Norfolk, Charleston, and Mare Island, $15,000 each.

Engineering.—$8,080,000; experiment station, $60,000; equipment of building, $20,000.

Naval Academy.—Civil list, $186,034; miscellaneous expenses, $33,500; maintenance, $275,000.

Marine Corps.—Pay, $4,345,469; provisions, $890,000; clothing, $620,063; fuel, $164,000; stores, $307,737; transportation, $317,000; repairs to barracks, $140,000; forage, $222,000; commutation of quarters, $79,000; contingency, $60,000.

The total appropriation for increase of the navy is $36,456,734. The bill also contains an item of $104,000 for the entertainment of officers and crews of foreign fleets attending the Panama-Pacific Exposition. A clause exempts foreign vessels on that occasion from the paying of tolls when passing through the Panama Canal. The Secretary of the Navy is authorized to establish suitable anchorage grounds in Hampton Roads and San Francisco Bay for the ships attending the exposition.—*Army and Navy Register.*

In the United States Naval Appropriation Bill there is a curious instruction relating to the three coast-defence boats. They are to be stationed in the Gulf of Mexico, but they are to be built on the Pacific coast, "provided that the cost of construction on the Pacific coast does not exceed the cost of construction on the Atlantic coast, plus the cost of transportation from the Atlantic to the Pacific."

Senator Weeks, of Massachusetts, on March 26 introduced a resolution directing the Secretary of the Navy to prepare plans and submit estimates of cost for utilizing some of the lighter cruisers of the navy for mail, passengers and freight service through the Panama Canal from New York and New Orleans to Valparaiso and intermediate points. Mr. Weeks mentioned

the second-class cruisers *Columbia* and *Minneapolis* and the scout cruisers *Chester, Birmingham* and *Salem*. He said that American commercial relations with South America were undeveloped, and that while foreign ship lines were alive to the opportunities to be opened by the Panama Canal, private enterprise in the United States seemed to hold back. Under the plan proposed by Mr. Weeks the cruisers, even while on strictly commercial business, would be manned by officers and men of the navy. The resolution was referred to the Committee on Naval Affairs. Secretary of the Navy Daniels is said to approve of Senator Weeks' plan.—*Army and Navy Journal.*

A report has been received that U. S. Senator Weeks and other Massachusetts congressmen have perfected all the necessary plans for establishing supplies' stores at the Boston Navy Yard, where the vessels which put in there may get all their supplies rather than buying them through the Brooklyn Navy Yard.—*Shipping Illustrated.*

Marston Niles, formerly of the navy, has published in pamphlet form a letter written to a United States Senator giving his views on the subject of Panama Canal tolls. In this Mr. Niles offers the following solution of the difficulty with which Congress has been struggling: "I have sought to outline certain reasons for my suggestion that the coastwise exemption clause would be unobjectionable to the British, and might stand in full force precisely as it is, only with a clause supplementary added—a clause directing that the tonnage be carefully measured in each case, and that the regular toll charge be assessed—assessed merely, not collected—and that the assessed charge be made to form a part of the total volume of transit shipping, American and foreign; of which total volume the tonnage of each ship, foreign or American (saving the coastwise) must pay its numerical share of the expense of the benefit—paying in bare money, as a condition precedent for transit. This would meet perfectly the contention of the notes of the British—one absolutely just—that unless the coastwise tonnage be reckoned in, swelling the common denominator of the several fractions which the various nationals are called upon to contribute, there would not be for the British any guarantee that British ships are paying no more than that 'just and equitable' fraction. The numerator would indeed be right. The denominator, however, would have shrunken. Therefore the fraction paid by the British would *per se* be bigger than the just fraction. This as they say, and as they are right in saying, would be unjust—highly so. It would be discrimination against the British, and the treaty says there shall be 'no discrimination.' The toll charge would not be a just and equitable one, and the treaty says that it shall be 'just and equitable.'"—*Army and Navy Journal.*

ADMIRAL DEWEY'S REASONS FOR FOUR BATTLESHIPS.—In the following interview, the admiral of the navy, George Dewey, explains the reasons for four battleships, and reviews the work of the General Board and the naval policies recommended to the Secretary of the Navy:

It was at the close of the Spanish-American War that the Navy Department came to the final, overwhelming conclusion that it was a great administrative organization, in which there was no individual who was assigned to the task of thinking, of working out the broad problems, of determining policy. The emergency of a war had shown the existence of a fleet of sufficient strength to meet the enemy with whom we were engaged. But it had shown also the need of a body to formulate war plans and devise naval strategy; a work that must necessarily be done without display or publicity. War plans and naval strategy, however, demand a national naval policy, which can never be secured except through publicity. The naval policy which we have formulated in the General Board and recommended to the Secretary of the Navy, has now been published by Secretary Daniels in his annual report for the benefit of Congress and the public.

Now, in relation to our work as members of the General Board, our body has no administrative powers. In the words of Moltke, "I cannot even command a corporal." At the outbreak of the Franco-Prussian War, a visitor called on von Moltke and expressed great surprise at finding him reading a popular novel instead of being buried in strategy and plans for the coming battles. Moltke replied, "I cannot even command a corporal, my work is already done; there are the plans," pointing to the maps and charts on the wall.

Our work has been to study such questions as the following:

What should be the strength of the fleet?
What should be the composition of the fleet?
What should be the disposition of the fleet?
Where should we have naval bases?
Where should we have fuel stations?
How should outlying possessions be defended?
How should the army and navy coordinate?
Making plans for war.
The use of the fleet in war.

The General Board realized from the beginning that the most important of these questions of policy upon which its advice was asked, was the forming of a definite program of what should be the strength of the American Navy. It recognized the necessity of a thorough study and mastery of that question, and also recognized its responsibility in forecasting the fleet needed to meet any probable enemy; to maintain well established national policies and to guarantee peace.

The General Board drew from history a knowledge of the terrible cost of wars in human lives and national treasure. Likewise it concluded that a nation well prepared for war need fear no attack. It has long been our conviction that the absence of a definite naval policy on the part of the United States, which has already placed us in a position of inferiority, may ultimately lead to war.

A careful study of our naval establishment as it exists to-day, leads unerringly to the conclusion that it grows from a need that the people feel instinctively, but know not how to meet. The masses of the people live inland, rarely see a battleship, and have no opportunity for gaining knowledge of the navy. They believe in an adequate navy, but are not sufficiently informed to urge their representatives as to its upbuilding. The result has been that the upbuilding of the navy has been haphazard; has been feverishly pushed at times when there was imminent national danger, and allowed to almost go by the board when there seemed no occasion for alarm to the untrained observer.

The General Board carefully studied the nation's commercial aspirations and the strength of the countries with whom commercial rivalry was likely to bring us in contact. It studied the well established national policies, like the Monroe Doctrine, and the restriction of Oriental immigration. It looked into possible complications over defending the Panama Canal and maintaining its neutrality. It became thoroughly convinced that these policies could not be sustained without an adequate navy; that America must have such a navy or surrender the place that it should justly hold among the nations of the world.

Added to this, the General Board studied the naval policies of other strong nations, familiarized itself with their degree of preparedness, and gained an estimate of their probable strength at a date twenty years ahead. It found that some of these nations had outlined for themselves definite programs that were to lead to a given strength at a given time. If the United States expected to be able to occupy a position of influence beside those nations at that time, it must adopt a program that would give it a comparable fleet at the future date.

So, after three years, the General Board, in 1903, was ready with its recommendations of a building program to last through the years and

result in a well-balanced and effective fleet in the year 1920. It was convinced of the advisability of substituting this continuing, consistent building program for the haphazard methods of annual appropriations.—*The Navy.*

OUR FOREIGN TRADE AND OUR NAVY.—Richard Wainwright, Rear Admiral, U. S. N., Retired.—Anyone who is interested in the advance of the United States as a world power will be well repaid for reading "The Trade of the World," by James D. Whelpley.

This most interesting book gives a luminous account of the foreign trade of Great Britain, Germany, France, Belgium, Austria, Hungary, Italy, Northern Africa, Japan, China, Russia, Argentina and Canada. Mr. Whelpley traces our trade relations with these countries and points out the strategy necessary for success and the paths that usually lead to failure. The statistics used serve to illuminate without burdening the text.

Anyone fond of good literature will enjoy this book and its value to all interested in our foreign commerce or in world politics is great, but above all it is valuable to those who would be assured of the necessity of a strong navy to ensure peace to the United States.

He says, "The noticeable features of the record of American exports for the past eighty-two years are that the export of foodstuffs has decreased rather than increased in proportion to business in other commodities; that the export of crude manufactured material has greatly decreased, and in fact, with the exception of cotton, has become a negligible quantity; and that the export of manufactured goods ready for consumption has increased enormously." From 9.34 per cent of the total exports in 1830 to 30.98 per cent in 1912. Again "Contained within the history of trading, lie all the romance and adventure of the sea and the frontier, the horrors of war, the privations and sufferings of exploration, the rise or fall of nations; in brief, the story of civilization and of barbarism."

During the time that the bulk of our exports were foodstuffs and crude manufactured material our foreign trade produced little or no international friction; but now manufactures are in excess of our needs and we are not only struggling for place in the markets of the world but are also forcing our goods on the home markets of our competitors. Our excess of manufactures over our own needs for home consumption is growing by leaps and bounds. Upon our finding outside markets for our wares depends our ability to support in comfort many of our fellow countrymen. Leaving out the effect on general prosperity, the effect on wages alone makes the question of foreign markets one of vital importance to organized labor.

After pointing out the great value of our cotton crop and how the necessities of the foreign spinner force its purchase, Mr. Whelpley says: "In the case of manufactured goods, however, a nation has the markets of the world to choose from, and the American manufacturer meets the Englishman, the German, the Frenchman, the Belgian, and others in the fiercest kind of competition when he offers for sale the products of iron and steel, the textile mills, machinery, large and small, and, in fact, anything which, given the raw material, human ingenuity fashions to the hand of man."

"It is in this field that diplomacy joins hands with commerce and industry, for modern diplomacy is based upon equal trading rights and trade extension." "There is still much high-flown talk about national honor, the dignity of nations, and the cause of humanity, but careful analysis fails to discover in any recent international dispute or agreement a single instance where the maintenance of trade, its extension, or trade jealousy or rivalry, is not the fundamental question at issue." And of what avail is the most skillful diplomacy without adequate force behind its arguments? The trained diplomat is needed to obtain a fair field and an open market, but his best efforts will be brushed aside unless behind them he can show military strength.

If any doubt that the measure of fair play and respect we receive is the strength of our navy let him read "One Hundred Years of Peace," by Henry Cabot Lodge.

Here in the clear and elegant sentences of Senator Lodge, he will see the need of a navy to exact merely decent treatment—every patriotic American should read the book. How much more it is needed when we are forcing our way into the markets of the world? Every day the newspapers bear evidence of trade friction with foreign nations. The question is no longer open to our choice. We must enter into this close competition whatever the hazards. Not only for fair treatment but, for what is more important, for peace on our own soil, we need a strong navy.

In its present state our navy is a danger. The great reviews, the reports of target practice and the general accounts of the navy in the papers have given the country a false idea of the strength of the navy and they are apt to place too great a reliance on its power. It is not strong enough for defence. It has many neglected wants, and while most efficient for its size, it is rapidly growing weaker by comparison with the great military powers of the world.—*The Navy.*

AMERICAN FLEET AND MEXICO.—Naval officers throughout Europe have, we may be sure, been watching with close attention the movements of the Atlantic fleet of the United States Navy since President Wilson's decision to take action against Mexico. Nominally this naval force consists of four divisions of five battleships, each with a fleet flagship. Actually it comprises 19 battleships only. Cable intelligence indicates that orders were issued to Rear Admiral Badger, the commander-in-chief, to concentrate every available vessel off the port of Tampico in order to make an impressive demonstration. Of the 19 ships it appears that only 11 were immediately available, and these consisted not of complete divisions, but of ships from all the four divisions. At the moment when the order was issued the *Arkansas* was at the New York Navy Yard, while the *North Dakota, Vermont, New Jersey, Rhode Island, Ohio, New Hampshire,* and *Michigan* were at other naval yards. Although the Navy Department at Washington must have been aware of the trend of events in Mexico, and the probability of the Atlantic fleet being required for duty, it appears as though it was caught unprepared. It may be, of course, that the ships were at the various dockyards merely in order to give leave to the crews, but in this case it would apparently have been a simple matter to recall officers and men and despatched a larger proportion of the 19 vessels than the 11 which Admiral Badger was able to promise the government for concentration off Tampico. The point is of interest, not so much as suggesting any defect in the American organization, as pointing to the conclusion that the periodical weakness of the squadrons of the British Home fleet, owing to the absence of ships for repair, is not peculiar to the British system of administration. No doubt the technical press on the other side of the Atlantic will examine the facts with full knowledge, and naval officers of the British fleet will await the result of the investigation with interest.—*Naval and Military Record.*

ORDNANCE AND GUNNERY

SUPERIORITY OF BRITISH GUN-MAKERS.—To those who live chiefly with the object of deprecating all things British, and especially the navy and its ordnance, the recent announcement of the First Lord of the Admiralty, during his introduction of the navy estimates, that our new 15-inch gun had been adopted for naval purposes without a trial gun having been made, must have come as a surprise. Such a performance, working out, as we are told it did, to a degree of accuracy hardly believable to a layman, as regards the ballistics promised by the designer of this piece of artillery, must convince other nations that our gun manufacturers are the equal of the best, and the superiors of most gun-makers of the world. There are few details of the weapon known outside the Admiralty, except that the gun has all the advantages of the 13.5-inch, multiplied in its increased caliber, and can throw a projectile weighing nearly a ton a distance of 10 or 12 miles, with wonderful accuracy, if correctly aimed. This at one bound puts us a long way ahead of our chief naval rivals, the Germans, who have only just advanced from the 12-inch to a 14-inch gun as the primary weapon of their capital ships whose keels are now being laid. The First Lord was naturally and very properly vague as to the capacity of our 15-inch gun, but a 30 per cent increase in efficiency—which is the rough figure he gave to Parliament and the country—speaks for itself, and is sure to be a very conservative estimate of the real capacity of this monster piece of ordnance, to be mounted in the *Queen Elizabeth* and her sisters. Its smashing power must be terrific, and its effect on an enemy extremely demoralizing at long range. —*United Service Gazette.*

THE 15-INCH GUN.—One of the most important decisions for many years was the advance from the 13.5-inch to the 15-inch gun. In the *Queen Elizabeth* type, the Admiralty wished to have exceptional speed without any loss of gun-power or protection or undue increase in displacement. One of the five turrets had to be given up to find room for the extra boiler power, and in order to maintain gun-power is was necessary to increase the caliber of the guns. The whole of the 15-inch guns for the 1912-13 programme were ordered without ever a trial gun being made. When the first 15-inch gun was tried a year ago, it yielded ballistic results which vindicated the minutest calculations of the designer. It is the best and most accurate gun at all ranges we have ever had; it reproduces all the virtues of the 13.5-inch gun on a larger scale. It discharges a projectile of nearly a ton in weight, and can hurl this immense mass of metal 10 or 12 miles. The high explosive charge which the 15-inch gun can carry through and get inside the thickest armor afloat is very nearly half as large again as the charge in the 13.5-inch gun. Owing to the trust which we were able to place in our artillery science, we shall have ten ships armed with this 15-inch weapon by the time any other naval power has two.

BATTLESHIP DESIGN.—Excerpt from paper read at the spring meetings of the Institution of Naval Architects by Mr. T. G. Owens, Naval Director and Chief Constructor of Vickers (Ltd.).—Although theoretically the 12-inch gun is already sufficiently powerful to penetrate the protection at all positions of the battleships of all the powers, with the exception of the United States, yet every country was now adopting a heavier gun than the 12-inch weapon. Mr. Owens admitted that, owing to the development of the torpedo, the battle range was increasing, and he also admitted that in practice the armor protection might not prove as vulnerable as theory suggested. Nevertheless he has reached the conclusion that there is no great necessity in the present or the immediate future for guns of larger caliber than the 14-inch, which at the range of probable maximum vision—say, 12,000 yards —would pierce the best Krupp armor of a thickness of 14 inches and deliver a bursting charge into the interior of the ship. The problem of the

naval architect was how best to mount a sufficient number of guns of the 14-inch caliber. He admitted that a four-turret center-line arrangement, if carrying sufficient gun-power, was, on the score of supervision, smaller target, and smaller number of gun's crew required to work it, preferable to that of a five or six-turret arrangement. If such turrets with their magazines were separated from each other by a considerable length of ship the chances were lessened of simultaneous destruction of turret and magazine by one lucky shot, which under present conditions was quite possible.—*Naval and Military Record.*

SUBMARINES OR HEAVIER GUNS.—"Great developments have recently taken place in (a) The heavy armament and armor of warships; (b) submarines; (c) aircraft. Consider how far this should justify alterations in the armament of our coast fortresses."

Such was the subject for the Duncan Prize Essay for 1913, and most interesting and instructive were the views of the numerous competitors for the coveted medal.

I propose to deal solely with (a) and the best means of attacking ships of the dreadnought type, which should form the equipment of a modern coast fortress. The developments which have taken place recently in the heavy armament and armor of warships, were dealt with more or less fully by all the essay writers, some of them going into great detail and showing considerable technical knowledge; the majority of writers concentrated on the extent to which this development calls for heavier guns in the shore batteries, how much heavier than the existing 9.2 they should be, and the number and distribution of such heavier guns required by coast fortresses of various classes; there were also advocates for an increase in the number of high-angle batteries, and equally eloquent and persuasive advocates for the entire abolition of such batteries.

But there was a remarkable absence of any discussion on the merits of coastal submarines on the part of the writers; possibly some of them argued that the question on the tapis was—how far alterations in the *armament* were justified, and that submarines are not *armament*. But whether submarines are *armament* (for the purpose of the essay) or not, really does not affect the question; the point is that the existence of a submarine flotilla in any defended port, does most assuredly affect the question of the gun armament required to prevent hostile warships from placing the coast fortress at a disadvantage in a battle action.

Since reading the essays, I have gone very carefully into the relative cost of submarines and gun batteries, and find that the existing coastal submarines (*C* class) cost 1/2.65 of the estimated cost of a 2-gun 13.5-inch breech-loading battery, and that the new coastal submarines are estimated to cost 1/1.8 of the cost[1] of such a battery. In making this comparison, I have assumed acceptance of the view that one submarine attacking a warship may be regarded as not less effective than one 2-gun battery; and further, that at the extreme ranges of the gun, when penetration is at a minimum, and observation most difficult, the submarine is relatively more effective than the battery.

It is moreover obvious that the continuous improvement in the power and radius of action of seagoing submarines must necessarily cause many less powerful craft to become regularly available for coastal defence, for which service they are admirably fitted; in such cases there will, strictly speaking, be no initial cost in the same sense as there is when a new means of attack or defence has to be provided for the specific service of a coast fortress.

There is a general consensus of opinion that our present coast armament is not sufficiently powerful to cope with the new conditions with which it is faced; and that greater offensive power in some shape or form is essential to enable coast fortresses to fulfil their rôle in the present day.

[1] This is exclusive of site value.

I think it has been sufficiently demonstrated that the cost of coastal submarines is much less than that of heavily armed shore batteries; the cost of upkeep, manning and training of personnel is also somewhat less. Having therefore disposed of the financial question, it only remains to consider whether coastal submarines can actually and effectively supersede the rôle of shore batteries armed with a considerably heavier gun than the 9.2 breech-loader.

As regards material effect, there can be no question that the torpedo is mightier than the gun, *and the moral effect* of the known presence of submarines is paralyzing. The submarine has a wider radius of action, but takes considerably longer to reach its objective than does the gun.

The organization of the coastal submarines for harbor defence in respect to what we in the R. G. A. term "Fire Control," must be dependent on the same system by which the selected military officer is enabled to inform fire commanders of the approach of a hostile or friendly warship; the exact procedure is, or should be, laid down by the naval authority in command of the port, and practiced as a matter of routine, constantly during the year. It is not possible to deal more in detail with this subject, without trenching on confidential matters, but I hope that enough has been said to draw more attention to this branch of coast fortress defence, a close study of which will, I believe, convince others besides the writer of the prize essay, that the further development of offensive action by a fortress against a ship, beyond the power of the 9.2 gun, lies with the submarine and not with the heavier gun.—*Journal of the Royal United Service Institution*, by Brig. Gen. F. G. Stone.

A NEW DETONATING AGENT.—Among the many important discoveries which have recently taken place in the world of armaments the progress in the manufacture of high explosives is not the least remarkable. Scarcely more than 30 years ago gun powder was the disruptive element universally employed in both artillery and submarine warfare. Guncotton on its discovery in the 70's, however, rapidly superseded the powder for mining and torpedo work. It had a far greater explosive effect, and although highly sensitive in its dry state, it was found that by the addition of roughly 20 per cent of water its sensitiveness could be reduced to such an extent that it was quite suitable as an explosive for submarine work. It had, however, the disadvantage that, in order to get the maximum results, it was necessary that the water or moisture should be evenly distributed throughout the body of the charge. On this account it was desirable to examine heavy charges at frequent intervals, rewetting them if necessary.

Experiments were subsequently carried out with a view to adopting wet guncotton as the bursting charge in shell, but these failed, as it was found that on discharge of the gun the moisture in the guncotton was set back to the end of the shell, and the consequent uneven distribution of the same led to failure, or incomplete detonation, of the bursting charge.

The introduction of lyddite marked a great advance in the matter of shell charges. Most of us can remember the belief which was popularly held at the time, that the fumes of a lyddite shell on bursting would poison human beings anywhere within a large radius! Although this and similar stories were of a somewhat exaggerated nature, lyddite (and its various disguises, melinite, shimose, etc.) was an enormous improvement upon gunpowder, being of higher loading density and possessing a far greater explosive force. Lyddite, which is merely picric acid melted and poured into the shell, possesses the disadvantages that it is highly poisonous in manufacture and that in contact with certain metals, noticeably lead, it forms dangerous picrates, which are in themselves capable of detonating the mass of the explosive.

Trinitrotoluol, or T. N. T. for short, is the latest entrant into the field of high explosives. It has the primary advantage (an important one from the arsenal, or manufacturing, point of view) that it can be employed as the bursting charge for not only shell, but mines and torpedoes also. It is

highly stable, and does not form metallic salts or lose its stability in the slightest degree on being brought into direct contact with metals; consequently it can be poured in a melted condition straight into the shell or other containing vessel.

To give some idea of its insensitiveness to shock or friction, it can be fired at at short range with rifle bullets and will not detonate; it can also be safely sawn through or turned up in a lathe with ordinary steel tools.

Fulminate of mercury alone is not sufficient to cause it to detonate, but merely blows it to pieces; consequently a special detonator, which will be referred to later, is employed for the purpose.

T. N. T. is non-hygroscopic, and unprotected charges have been left under water for several months, and on being fired have given complete detonation. In addition to being melted, T. N. T. can be compressed in its powder form to a high density, and it is usual to employ a small "primer" of this compressed material in order to get the most complete detonation of a melted charge.

Experiments are, however, now taking place as a result of which it is probable that the compressed primer will be able to be dispensed with in shell charges. If ignited T. N. T. burns quietly with a black smoke, but without explosion. It has not only a higher density, but also a far greater velocity of detonation than wet guncotton.

As regards detonators, for many years fulminate of mercury was the only substance employed for the purpose of providing the initial impulse necessary to bring about explosion. Now, as already mentioned, it has not the power to detonate a modern high explosive such as T. N. T. Consequently the greater portion of the substance in a detonator nowadays consists of tetranitromethylaniline, or tetryl, as it is more familiarly known. A very small quantity of fulminate of mercury is loaded next to the cap of the detonator, and the remaining space is filled with tetryl.

Fulminate of mercury has many disadvantages; it is highly sensitive, if heavily compressed it loses its power, and the slightest admixture of water, or even exposure to moisture, renders it ineffective.

Many attempts have been made to discover some substance which would serve as a substitute for fulminate of mercury, but hitherto all experiments to that end have resulted in failure. Now, however, we hear of lead azide, a detonating agent which is attracting the greatest attention both in this country and abroad, and for which the following advantages are claimed in comparison with fulminate of mercury:

Half as sensitive to shock or friction.

Twice the stability on being heated.

Can be compressed to a very high density without losing power.

Has a far greater capacity of initiating detonation, consequently a much smaller detonator can be employed.

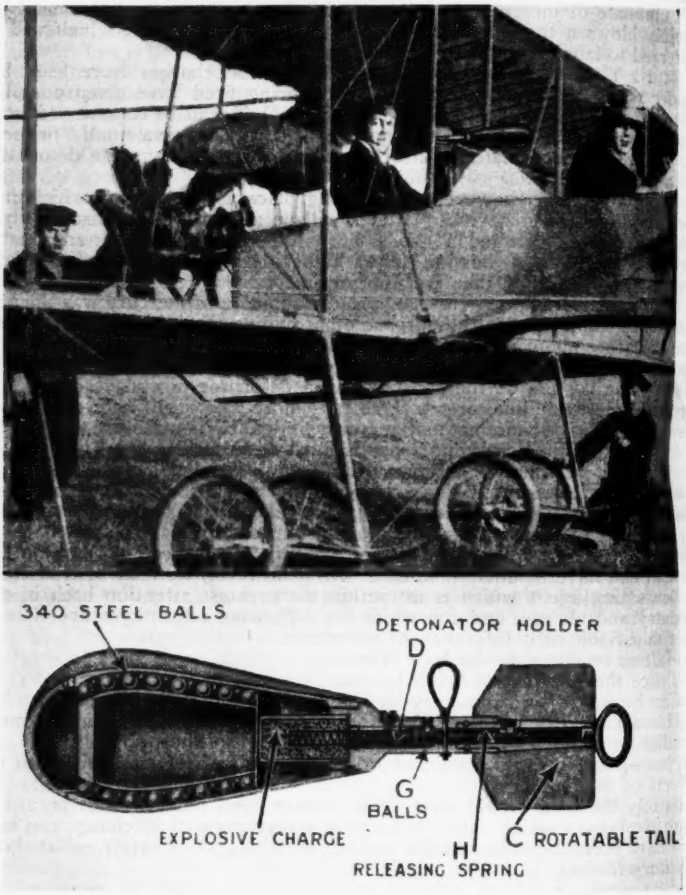
And—possibly most important of all—it is absolutely insensitive to the effects of moisture.

Surely the limit would now seem to have been reached with regard to high explosives which, while possessing a maximum of efficiency, can with ordinary precautions be handled and stored with perfect safety.—*Naval and Military Record.*

AN AEROPLANE BOMB THAT EXPLODES ONLY ON STRIKING THE GROUND.—The new Marten-Hale aeroplane bomb, recently tested in England, has a very simple priming mechanism so that it can be carried in a magazine on board an aeroplane without danger of accidental explosion. Should a bomb be hit while the aeroplane is in flight, or in case the aeroplane descended violently to the ground, by accident or otherwise, it is impossible for an explosion to take place. The bomb can explode only upon making a certain fall through the air and then striking the ground or other obstacle.

At the top the bomb has a tail piece *C* rotatable by the air vanes. The detonator holder *D* is held up away from the main charge by means of

its collar and ball-bearing *G* held in place by the projecting end of a screw releasing spindle *H*. When the bomb drops and the spindle rotates through the action of the vanes, it is screwed up until the projection moves away from the steel balls and allows them to fall inward, thus releasing the collar and the detonator. But the detonator still remains off the charge through the spring. When the bomb hits the ground, the detonator



AN AEROPLANE BOMB THAT EXPLODES ONLY WHEN IT HITS THE GROUND.

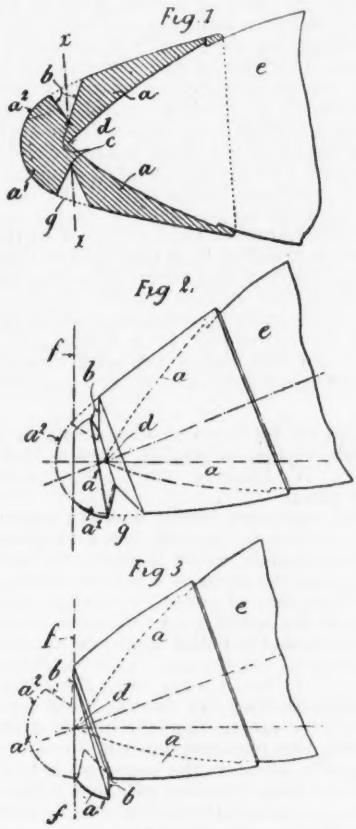
falls down on the charge and fires it, exploding the bomb in the customary way. Such bombs can be dropped simply by hand from the aeroplane or can be fired by a spring gun in case a greater velocity is required.

We illustrate a bomb of the shrapnel type, which has a total weight of 20 pounds and carries an explosive charge of about four pounds of trinitrotoluol. It has 340 steel balls, which weigh 5 pounds 12 ounces.

A drop through at least 200 feet in the air is needed in order to cause the rotation of the tail end sufficient to give the release and arm the bomb as

we have just seen, and as the firing mechanism is very sensitive, it gives an explosion upon the least impact even on water, mud, snow or the envelope. The angle of incidence can be as low as five degrees, as it is found. It is found that when dropped in any position from the aeroplane or at any speed of flight, the projectile soon takes the vertical position. —*Scientific American.*

CAPS FOR ARMOR-PIERCING PROJECTILES.*—When an armor-piercing projectile fitted with a cap of any of the kinds now commonly used strikes obliquely against a hard-faced armor plate, the metal of the cap which lies



on that side of the point of the projectile which forms an acute angle with the plate has to be displaced in a radial direction more rapidly than the metal of the cap which lies on the side which forms an obtuse angle with the plate, with the result that the lateral or radial pressure exerted by the cap upon the pointed end portion of the projectile due to the inertia of the mass of cap metal is considerably increased on the side nearest to the plate,

* British Patent No. 21903, October 1, 1913, by Sir R. A. Hadfield, F. R. S., A. M. Jack, and Major A. B. H. Clerke.

that is to say on the side forming an acute angle with the plate, as compared with that on the other side of the projectile, the side forming an obtuse angle with the plate, thus causing an unbalanced lateral or transverse stress on the pointed end portion of the projectile in addition to the stress exerted thereon when the point of the projectile reaches the plate, with the result that the projectile seldom or never completely perforates the plate without being itself broken up, except at comparatively high velocities. This invention has for object to provide caps adapted to afford a more uniform and effective support to the pointed end portion of a projectile than hitherto when striking a hard-faced armor plate obliquely, so that the projectile may completely perforate the plate without becoming broken up, even when traveling at a comparatively low velocity. Fig. 1 shows in longitudinal section a solid cap applied to the pointed ogival end portion of an armor-piercing shell which is shown in elevation. Figs. 2 and 3 are similar views showing two stages of how the forward end portion of the cap is thrown over or displaced on striking an armor plate obliquely. The cap *a*, which externally is mainly of ogival shape with a solid forward end portion a^1 having a rounded or convex front surface a^2, has formed therein an annular groove *b* of vee shape the inner end or bottom of which surrounds a solid portion *c* of the cap metal of reduced cross sectional area located in a plane *xx* transverse to the axis of the cap which plane passes through or closely adjacent to the point *d* of the projectile *e*. Figs. 2 and 3 show approximately how the head portion a^1 of the cap on striking an armor plate, indicated at *f*, obliquely, is displaced to that side of the pointed end portion of the projectile *e* that forms an obtuse angle with the plate. The groove *b* may be covered by sheet material, as indicated by dotted lines at *g* (Fig. 1) to present a continuous surface to the air during flight. Or the cap may, if desired, be surmounted by a hollow air deflector of known construction. Such a cap will enclose the solid forward end portion a^1 of the cap and be secured to the body or rear portion *b* of the cap.

THE DOUBLE REPORT OF PROJECTILES.—Referring to the cracking sound, or sound of a double report, noticeable when a high velocity projectile passes, Lieutenant G. W. Edgerly, 5th U. S. Infantry, writing to the *Scientific American*, says:

"This sound, which may seem louder than the report of the piece if the latter is fired from a distance, is only noted in projectiles of a greater velocity than 1100 foot-seconds, which is about that of sound waves, and is caused by the bullet passing through the atmosphere. As its velocity is equal to or greater than that of sound, its arrival at a point opposite the hearer precedes that of the sound waves it set up at an earlier stage of its flight, and the sharp crack the bullet makes is caused at that part of its flight opposite to or nearest the hearer. As it recedes from the hearer, the sound waves apparently follow it away from the hearer, and do not come strongly back to him, and they are drowned out by the relatively more intense sound made by the projectile at the instant it passed him. If, however, the person noting this phenomenon is at some distance from the line of flight of the projectile, he hears the sound made by the projectile over a considerable part of its course blending with and following the sharp report it makes as it passes him, and if his position is sufficiently distant, the report of the projectile so blends with this whizzing or roaring sound as to be nearly lost in it. In the case of a small bullet, the sound much resembles the tearing sound made in tearing stiff, strong cloth, and in case of a large projectile it sounds much like a train in a tunnel or covered bridge. It follows that unless one is very distant from its course, he cannot hear such a swift-moving projectile until it has passed him; therefore, the bullet he hears can never strike him. A small bullet is not often heard after being fired by one standing near the firer, as the rifle report drowns the sound it makes for a long enough time to permit it to travel beyond hearing distance, but this is not true of cannon projectiles, which make a much

louder sound, audible farther away. Modern high-velocity bullets do not "whistle" until they take up a ricochet flight, after grazing some object, unless they tumble, or otherwise fail to fly true. Under the latter conditions they emit the weirdest sounds imaginable, in great variety. This is due to their low velocity, often distorted shape, and erratic flight."

IS OUR TARGET PRACTICE EQUAL TO THE BEST?—The *Scientific American* recently stated that our target practice was probably no better than that of the other leading naval powers, and not nearly so good as that of one particular navy. We have frequently been asked which particular navy it is that is doing better work at target practice than our own. There is no reason for concealing the fact that it is the British navy which is so greatly in the lead, and that the cause of its superiority, as compared with our own, is its adoption of what is known as the "director system" of firing. Director firing was developed by Admiral Sir Percy Scott, and it was he also who elaborated the system of fire control by spotting, which he gave to an American officer, a close friend of his, when they were on the China station years ago—a system which has been steadily followed and equally improved in both navies for years; which is still in force in our navy; and which was abandoned last year in the British Navy in favor of the vastly superior "director system" as devised by Scott.

In the old Scott system, which we are still following, there is a pointer at each gun, who tries to keep his sights continually on the target. When all the guns are loaded the fire-control officer sounds a "buzzer" at each gun, and on hearing this each pointer is expected to instantly fire his gun—*if he is exactly on the target.* If he is above or below the target he must not fire, but must wait for the next round. Now it is human nature to want to be "in the game," and too often the pointer will "let fly," whether he is on or off the mark. If his horizontal wire is above the target by ever so little his shell may drop a thousand yards over the target, if below he may be as much short. The result is that the spotter is bewildered by the wide range of "dispersion" as it is called and does not know whether the range for the whole battery should be put "up" or "down" or left where it is.

Now in the director system the errors due to the human element are eliminated by using one telescope and one pointer for the whole battery. Only one gun—the master or director gun—has a telescope and at this is placed the crack pointer of the whole ship's company. The other guns are trued up in parallel with the master gun and move exactly with it. The master gunner keeps steadily "on" the target, and the instant the battery is loaded he presses the firing button, and the guns being elevated to exactly the same degree, the shots fall bunched in practically the same place, and the spotter on the top of the mast is able to tell with great accuracy how far the splash is "short" or "over."

It is this cutting out of the errors of the individual pointers and consequent bunching of the shots that makes director firing such a great step in advance of the old Scott system, which we are still using. The spotter can quickly pull the salvos on to the target and hold them there unerringly.

Now for results. After spending no small amount of his own money in the purchase of gear with which to test his system on his own ship, Admiral Scott succeeded in getting it applied to a dreadnought, the *Thunderer*. This ship was sent out with a sister ship, the *Orion*, fitted for individual pointing, as practiced by us to-day, and, under exactly identical conditions of wind, weather, range, and speed, she put four times as many shots through the target—at least so said the cabled dispatches at the time. So startling was the improvement that the British Government voted the full sum necessary at once to apply the system to the whole fleet.

But there is nothing like first-hand information; and we have it from Sir Percy Scott himself, who during a lengthy conversation last year on director firing in general, informed the editor that the *introduction of*

director firing had increased the hits in target practice for the whole navy over one hundred per cent.

What then are we to make of the statement of Rear Admiral Joseph Strauss, U. S. N., Chief of the Bureau of Ordnance, before the House Naval Affairs Committee, on January 19, that the Scott director system "had been experimented with in the American Navy and found not as accurate or satisfactory as the American method of firing salvos"? The American method is the old Scott method, and we have the best grounds in the world for stating that the director experiments referred to were not the true Scott methods, but only a guess at them, and a very wide guess at that.

This depreciation of director firing by Mr. Strauss is most unfortunate, made as it was to the House Naval Committee, on whom the further policy of advancement so greatly depends. For the information of the House we repeat that the Scott system has never yet been tried out in our navy; the *Scientific American* learned last year by personal investigation that director firing is absorbing the closest attention of navy artillerists throughout Europe; that because of the lack of initiative in this matter in our Bureau of Ordnance we are already far behind one great naval power in target results; and that in view of the active work being done in director firing by Germany (to mention one other power), the results of which, the writer is reliably informed, are very promising, we are in danger in falling behind that country in target practice as far as we have in battleship strength.—*Scientific American.*

FRENCH TARGET PRACTICE.—The fine performance of the *Voltaire* making 47 per cent of hits at ranges of 10,500 to 12,000 meters, though accomplished under conditions far from being so realistic as those observed in British battle practice, points, nevertheless, to no mean degree of efficiency. It is the anxious desire of the authorities of the Rue Royale to keep unimpaired so valuable an asset, and a series of measures have been decided upon with that end in view. Rear Admiral Lacaze, who is, like his successful predecessor at the head of the second division—Rear Admiral Gauchet—a noted gunnery specialist, is to act as inspector of target practice with extended powers, whilst special financial and promotion advantages will reward fully-qualified specialists for their zeal and ability in the discharge of their responsible duties. It is probable that the condemned *Masséna* of 12,000 tons will be adopted as up-to-date target ship.—*Naval and Military Record.*

NOTE ON THE CORRECTION FOR WIND.—By P. Charbonnier, Chief Engineer of Naval Artillery (France).—1. The well-known theory by which is calculated the effect of wind upon the trajectory of a given projectile is assumed.

If, of a wind blowing horizontally, we designate by w_1 and w_2 the components in the plane of departure and in a plane at right angles thereto (under the supposition that the two components are small in comparison with the horizontal velocity u of the projectile, which renders it permissible to consider separately the effect of the two components), we have the formulas

$$\frac{(\Delta X)_w}{X} = \frac{w_1}{u_0} C_w (u_0, u_\omega)$$

$$Z = w_2 \left(T - \frac{X}{u_0} \right)$$

for the change (ΔX) in the range X and the lateral deviation Z. Moreover, in direct fire, the secondary function C_w is known; so that, in the case of resistance of the air expressed by the monomial $F(v) = Bnv^m$, we have

$$(\Delta X)_w = w_1 \left[T - \frac{X}{u_0} + (n-1) \left(1 + \frac{\tan \alpha}{\tan \omega} \right) \frac{X}{u_0} \right]^*$$

* See *Balistique exterieure rationnelle. Problemes balistiques secondaries.* E. S., Paris, Doin, 1907, p. 73.

The method of deducing these formulas is well known, whether by General Didion's theory, which regards the relative motion of the projectile, or by direct investigation, the corrective forces due to the action of the wind being introduced.

2. Concerning the foregoing formulas it is sometimes asked why they take no account of the form of projectile. In particular, it appears singular that in the expression for the deviation Z there is not introduced, in one form or another, a term representing the lateral surface of the projectile, a surface which, it would seem, must nevertheless affect the phenomena. No distinction is made between a long projectile and a short one, while to common sense it is obvious that the action of the wind on the two must differ.

That the usual formulas do not take into account the form of projectile is not surprising, when it is remembered that they are deduced from the theories of *Balistique du point matériel* (ballistics of the material point), which reduces all projectiles to their center of gravity by transferring to that point (and parallel to their true directions) all forces concerned.

But it is, however, very easy to deduce formulas which are in conformity with *Balistique du solide invariable* (ballistics of a rigid body); such is the object of this note.

Lateral Deviation

3. We must introduce the action of an oblique resistance. Let us take a projectile moving horizontally with the velocity u (we are here concerned with direct fire). Perpendicular to its trajectory (Fig. 1) is blowing a wind w_2, very small in comparison with u.

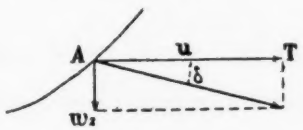


FIG. 1

The action of the air on a point A of the lateral surface of the projectile is equivalent to that due to a velocity,

$$u' = \sqrt{u^2 + w_2^2} = u\left[1 + \frac{1}{2}\left(\frac{w_2}{u}\right)^2\right]$$

which makes with the direction of motion, AT, an angle

$$\delta = \frac{w_2}{u}$$

Now, the problem of finding the components of a resistance $cF(u')$ making an angle δ with the direction of motion is a common one, which serves, for instance, as the basis of numerical application of the theory of drift.

We know, indeed, that, for small angles δ, the resistance of the air passes through a point C (Fig. 2) called the *center of resistance;* and that it makes with the direction of motion, GT, an angle δ', different from δ, and such that it may be represented by the formula,

$$\delta' = k\delta$$

in which k is a constant, characteristic of the form of projectile for oblique resistance.

Let us cause the center of gravity G to be acted upon by two equal and opposed forces R' and R'' parallel to the force R applied at C (Fig. 2).

The force R' will affect the motion of the center of gravity. The couple,

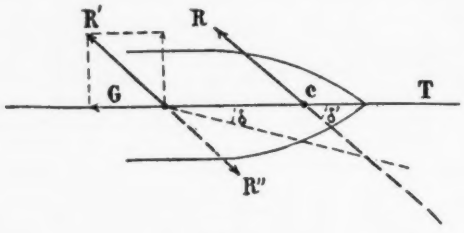


FIG. 2

$R''GCR$, will tend to cause the projectile to turn. Its action is identical with that of the oblique resistance applied at the same point C and due to the motion of rotation of the projectile combined with the progressive depression of the tangent to the trajectory. Then this couple will generate a *precession* the velocity of which is exactly the same as that of the precession ordinarily considered in the theory of drift.

There remains the action of the force R' upon the center of gravity, and it will be resolved into two components:

(1) One is $R' \cos \delta'$ along GT.

$$R' \cos \delta' = - cF(u)$$

$$R' = - cF(u'')$$

where

$$u'' = u\left(1 + \frac{1}{2}\delta'^2 \ldots\right) = u'\left(1 = \frac{1}{2}\delta^2 + \frac{1}{2}\delta'^2 \ldots\right)$$

Neglecting all terms in this expression except unity, we have

$$R' = - cF(u')$$

where

$$u' = u\left[1 + \frac{1}{2}\left(\frac{w}{u}\right)^2 \ldots .\right]$$

Whence, neglecting all terms except unity, we have,

$$R' = - cF(u)$$

(2) The other is $R' \sin \delta'$, at right angles to the trajectory, the expression for which is

$$\delta' cF(u) = k \frac{w_2}{u} cF(u)$$

Therefore, a cross wind w_2 does not appreciably affect the vertical projection of the trajectory. It gives rise, at right angles to the plane of departure, to a force of which the acceleration is:

$$E_z = k \frac{w_2}{u} cF(u)$$

4. Let O, Fig. 3, be the origin, Ox the trace of the place of projection, Oz a horizontal axis. The projectile, under the influence of the disturbing acceleration E_z, which is very small, departs very slightly from the plane of

departure and, when it shall have arrived at I, the tangent, II', to the trajectory which it describes will make with the axis Ox a very small angle η. The acceleration of the resistance of the air $cF(u)$ has as components

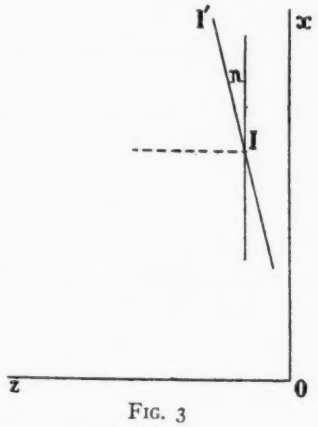


FIG. 3

$-cF(u)$, in the direction of the axis x, and $-\eta cF(u)$, in the direction of the axis z. We shall have, then, as the equation of the horizontal motion:

$$\frac{d^2z}{dt^2} = -\eta cF + E_z$$

But, by definition,

$$dz = \eta dx$$

whence, by differentiation,

$$\frac{d^2z}{dt^2} = \eta \frac{d^2x}{dt^2} + \frac{d\eta}{dt}\frac{dx}{dt}$$

which, substituting $-cF$ for $\frac{d^2x}{dt^2}$, will become,

$$\frac{d^2z}{dt^2} = -\eta cF + \frac{d\eta}{dt}\frac{dx}{dt}$$

We then have, combining the two expressions for $\frac{d^2z}{dt^2}$, the formula:

$$\frac{d\eta}{dt}\frac{dx}{dt} = E_z$$

Now, since $u = \frac{dx}{dt}$, it will become

$$d\eta = E_z \frac{dt}{u}$$

Then integrating once we derive, for the value of the inclination η, the formula:

$$\eta = \int_0^t E_z \frac{dt}{u}$$

Since $dz = \eta dx$, we may write, after a second integration:

$$z = \int_0^x dx \int_0^t E_z \frac{dt}{u}$$

That is the equation of the horizontal projection of the trajectory, due to any disturbing acceleration whatever, Ez.

5. Let us take as an example a cross wind w_2 which causes a lateral acceleration:

$$E_z = k\frac{w_2}{u}\,cF$$

We shall have:

$$\eta = kw_2\int_{u_0}^{u}\frac{cF}{u^2}\,dt$$

But in direct fire we have:

$$dt = -\frac{du}{cF}$$

Hence,

$$\eta = -kw\int_{u_0}^{u}\frac{du}{u^2} = -\overline{kw_2}\left(\frac{1}{u_0}-\frac{1}{u}\right)$$

On the other hand:

$$dz = \eta dx = -kw_2\left(\frac{dx}{u_0}-\frac{dx}{u}\right)$$

But,

$$dx = u\,dt$$

therefore,

$$dz = -kw_2\left(\frac{dx}{u_0}-dt\right)$$

that is to say:

$$z = kw_2\left(t-\frac{x}{u_0}\right)$$

which is the formula we desired; and it differs from the usual formula only in the presence of the factor k of oblique resistance.

Effect on Range

6. Let us now investigate (still considering direct fire) the action of a head wind w_1 in the plane of departure. Let us proceed as before (Fig. 4).

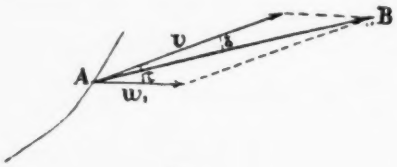


FIG. 4

The resultant of the forces v and w_1 at the point A is along AB, and we have:

$$AB^2 = v^2 + w_1^2 + 2vw_1\cos\tau$$

Or, in the case of direct fire:

$$AB = u + w_1$$

But the angle δ is such that

$$\frac{w_1}{\delta} = \frac{u + w_1}{\tan \tau}$$

hence,

$$\delta = \frac{w_1}{u + w_1} \tan \tau = \frac{w_1}{u} \tan \tau$$

If we combine (Fig. 5) all resistances due to forces such as AB acting

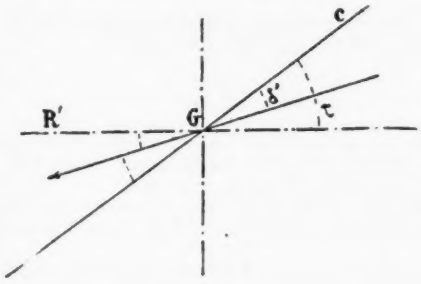


FIG. 5

upon the different points of the surface of the projectile, they give a resultant $cF(u + w_1)$ applied at the center of resistance C, and making with the tangent to the trajectory an angle δ' such that:

$$\delta' = k\delta = \frac{kw_1}{u} \tan \tau$$

This force will give rise to a couple which will influence the motion of the projectile about its center of gravity, but will still cause a precession having the same velocity as that due to drift.

But the force $cF(u + w_1)$, transferred to the center of gravity G, will be resolved into two others:

(1) $R' \cos(\tau - \delta')$, in the horizontal direction, which may be reduced for the fire to:

$$-R' = cF(u + w_1)$$

(2) $R' \sin(\tau - \delta')$, in the vertical direction.

But,

$$\sin(\tau - \delta') = \tan \tau - \delta' = \left(1 - \frac{kw_1}{u}\right) \tan \tau$$

The vertical component is, therefore:

$$-cF(u + w_1)\left(1 - \frac{kw_1}{w}\right) \tan \tau$$

The differential equations for the motion of the projectile are, therefore:

$$\frac{d^2x}{dt^2} = -cF(u + w_1)$$

$$\frac{d^2y}{dt^2} = -cF(u + w_1)\left(1 - k\frac{w_1}{u}\right) \tan \tau - g$$

If, in this system of differential equations, we make $k=1$, we get the trajectory in air in motion of the usual theory, which requires, relatively to the trajectory in air at rest, a correction,

$$\frac{(\Delta X)_w}{X}=\frac{w_1}{u_0}C(u_0,\ u_\omega)$$

It follows from this that, since we may write

$$\frac{d^2y}{dt^2}=-cF(u+w_1)\left(1-\frac{w_1}{u}\right)\tan\tau-g+(k-1)cF(u+w)_1\frac{w_1}{u}\tan\tau$$

the effect of the form of projectile may be provided for by the introduction of a corrective force the expression for which is:

$$E_y=(k-1)\frac{w_1}{u}cF(u)\tan\tau$$

It will be sufficient to calculate the effect on the range caused by that corrective force, and then to add it to the usual correction. In that way the complete solution of the problem may be had.

It will be observed at once that the effect of E_y will be very small, because of the factor $\tan\tau$, which is small in direct fire and changes its sign at the summit.

7. As for the calculation of $(\Delta X)_1$, a correction complementary to the usual correction $(\Delta X)_w$, it presents no difficulty. We have given elsewhere the general calculation of the range corrections for any disturbing accelerations, E_x and E_y.

If $E_x=0$, we have:

$$(\Delta X)_1=-\frac{1}{c^2\tan\omega}\int_{u_0}^{u}\frac{udu}{F}\int_{u_0}^{u}E_y\frac{du}{uF}$$

a formula which here becomes:

$$(\Delta X)_1=-\frac{(k-1)w_1}{c\tan\omega}\int_{u_0}^{u}\frac{udu}{F}\int_{u_0}^{u}\tan\tau\frac{du}{u^2}$$

We shall substitute for $\tan\tau$, $q-\frac{J(u)}{c}$, in which $q=tan\,\alpha+\frac{J_0}{c}$ and we shall have, by the introduction of some ballistic functions, the solution of the problem.

It does not appear useful to introduce that calculation here.

Conclusions

8. The influence of the form of projectile is provided for, in air in motion, by introducing in the formulas the *coefficient of oblique resistance* k. A couple results which, applied at the center of resistance, causes a movement of precession, the velocity of which is the same as that of the movement of precession considered in the usual theory of drift.

9. A cross wind of velocity w_2 causes a lateral deviation equal to that given by the usual theory multiplied by the factor k. This factor, which depends upon the form of the ogive, has, in the case of the not very pointed projectiles now in use, values of 2 and 3. If we consider very pointed ogives, this number increases considerably and can be as large as from 7 to 10. The long pointed projectile will, therefore, be very sensitive to a cross wind, and the changes in the velocity of the wind from shot to shot will tend to make the firing irregular in direction.

10. A wind w_1 blowing horizontally in the plane of departure causes a change in range which can be, as a rule, calculated by the usual formulas.

The effect of the form of projectile represented by the factor of oblique resistance, *k*, enters, indeed, only in a correcting term which is very small relatively to the value calculated by the usual method. The influence of the form [for wind correction] is, then, much less in range than in deflection; and that is easily conceivable, in direct fire at least, where the projectile moves with its axis almost horizontal.—*Revue d'Artillerie.*

FIRE ACTION AGAINST AIRCRAFT.—Translated from *Jahrbücher für die Deutsche Armee und Marine,* August, 1913, by Captain A. J. R. Gregory, R. G. A.—Artillery fire with percussion fuzes is of little value against aircraft as it gives no data for corrections, and is only possible with special projectiles fitted with tracers. The trajectory must be flat, and a high velocity is essential to give long range bursts with a time fuze. The weapon to be employed must be a gun, but the field gun cannot reach the target without its trail being sunk in the ground. This takes time and is not possible in all soils so that the gun is powerless against rapidly moving targets, for unless the trail is sunk the shell cannot rise above 500 meters with maximum elevation. Light field howitzers are better in the latter respect, but in either case the range of the time fuze is too short. Anti-aircraft guns have been constructed and mounted both on field carriages and on motor vehicles. These give a high muzzle velocity, a wide range of elevation, and are fitted with all the appliances for developing a rapid rate of fire. Their caliber is about the same as that of the field gun, their field of fire is such that they can engage any aerial target within range of vision, but their time fuze is limited as regards length of burning by the small caliber.

One may be allowed to express the wish that the whole of our field artillery might be placed in a condition to deal with aircraft.

The first essential would be to increase the maximum elevation of the guns. This can only be effectually carried out by providing entirely new carriages, though 10 or 15 degrees of elevation might be gained without great expenditure, and even this gain would be of the greatest value. It is worth while considering whether at least a certain proportion of the guns of each division should not be provided with new carriages of a suitable type instead of creating large numbers of anti-airship batteries.

Even for ordinary targets a longer burning fuze is essential for both field guns. Either a mechanical fuze or one with a spiral burning composition would appear necessary against aerial targets.

Where mobility is not essential, as in fortresses, bridge-heads, etc., heavy ordnance may with advantage be used. The necessity for a long burning time fuze and for great rapidity of fire point to a gun of smaller caliber as being the most suitable. With a fixed gun platform arrangements for high angles of elevation can easily be made so long as sufficient stability is retained. The long range of the time fuze can in this case be taken advantage of provided distant observers can give early information as to the target and range by telephone.

Firing against aircraft presents a most difficult problem. There are practically no data for estimating the range. The apparent size of the target furnishes the only available information, and a range-finder is therefore a necessity. The measurement of ranges to rapidly moving objects is difficult but practicable with sufficient training.

The point of greatest difficulty is to make a sufficiently accurate allowance for the change of range between the time of taking the range to the time of arrival of the projectile at the target. Further, the trajectory to a target placed at a considerably greater height than the gun is of an entirely different form from that to a target at the same range but in the same horizontal plane as the gun. The assumed rigidity of the trajectory is approximately correct only for targets on the earth's surface. The reason for this is that the force of gravity may be considered as acting at right angles to the line of sight with sufficient accuracy only when no great difference in

height is involved. The following explanation shows that this assumption cannot be admitted when dealing with aerial targets at high elevations.

Let Z and Z_1 be two targets at equal ranges, the one in the same horizontal plane as the gun, the other at a high elevation. (Fig. 1.) P and P_1 are the points which, if the force of gravity did not act, the projectiles would reach in equal times with the angle of elevation a due to the range SZ plus angle of sight. Gravity causes the projectiles to fall from P to Z and from P_1 to Z_1, but the latter projectile will not strike Z_1 which, if the assumption of the rigidity of the trajectory were correct, it should do.

We see from the illustration that there is a considerable difference between the two trajectories and this difference increases with the angle of sight. This shortening of the trajectory, or retardation of the shell, is of great importance when using time fuzes on account of the increased fuze setting required.

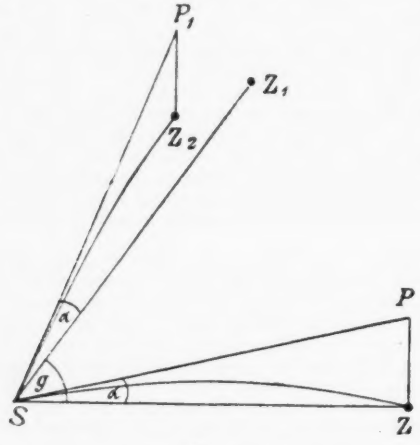


FIG. 1.

A second influence acting on trajectories at high elevations is the variation in atmospheric resistance. When firing at targets on the ground the projectiles traverse the lowest and densest strata of air, and have a comparatively great resistance to overcome. When the target is high in the air the shell passes through higher and thinner atmosphere, the resistance becomes less and the shell ranges further. The reduced atmospheric pressure has also the effect of causing a slower rate of burning of the time fuze and a shortening of the fuze setting required.

Thus the alteration in direction of the action of gravity with reference to the line of sight and the reduced atmospheric density both affect the elevation and the fuze setting required in opposite directions. To what extent they neutralize one another cannot be determined.

From the above it follows that even apart from the speed of the target the ranges found by the range-finder to an aerial target give only a rough guide.

Rifle fire must take the form of collective fire with several elevations, and ample ammunition must be made available. As a rule whole companies should be employed. At ranges below 1200 meters effect may be expected even against aeroplanes.

For artillery the range might be roughly found by the employment of a bracket. The instructions for practice for field artillery anticipate the use of the bracket in the case of the low rate of speed of airships, but this employment of the bracket system is most difficult. Even against targets

travelling rapidly on the ground the use of the bracket and the realization of effective fire is a task which taxes the strength and skill of the B. C. and the training of the battery to the utmost.

The speed of an airship is twice as great as that which any target on the ground, excepting a railway train, can develop. In addition, there is the difficulty of bursting shell at such a point as to give the B. C. the information he requires. This difficulty becomes almost an impossibility if the target makes sudden changes in its direction laterally, or worse still, vertically. It is almost impossible to estimate the speed of the target before opening fire. Generally no time can be spared for measuring the speed and immediate action must be taken. For these reasons one would in practice probably dispense with bracketing when engaging aircraft and go straight to fire for effect with an echelon of ranges of 100 or 200 meters between each gun, as is in fact prescribed by the instructions for practice in the case of rapid targets.

Ammunition must not be spared. It is questionable whether a single battery could be certain of success in such a case or whether a whole brigade should be brought into action. With an echelon of ranges of 200 meters between each of the 18 guns of a brigade, a zone of great depth would be swept by such a hail of bullets and fragments as to render hits certain. In order to ensure rapidity of fire, each gun should, unless otherwise ordered, continue to fire at the same range. The allotment of ranges depends on the maximum range of the time fuze, a decreasing echelon from this range throughout the brigade would thus cover a depth of 3½ kilometers. The brigade commander would order the target and opening of fire as soon as the range-finder showed that it had entered the zone of his time fuze. The consumption of ammunition need not be greater than for a single battery. Two or three rounds of gun fire, as previously ordered, should suffice and would give a greater probability of effect than three times the number of rounds from a single battery. This method should also prove successful against aeroplanes where a single battery would be almost helpless.

Two further difficulties present themselves, firstly the identification of the nationality of the target, and secondly the danger to one's own troops by firing at the target. Under ordinary circumstances dirigibles can be recognized at 10 kilometers and aeroplanes at 6 kilometers, but it will seldom be possible to know definitely to which side they belong. The shape of the dirigible will often give the information required, but in the case of aeroplanes there can be very little certainty even at close ranges.

Troops should be taught the appearance of their own and the enemy's aircraft so that there may be no doubt as to the nationality of a vessel as soon as it has been clearly recognized. Possibly an international understanding may be arrived at with regard to the identification marks to be carried by such vessels, but in no case should fire be opened against such targets until their hostile nature has been placed beyond all doubt. But on whom is the responsibility in this respect to be laid? Who shall decide whether our own troops will be endangered by fire directed against aircraft? Is the decision to be left to superior authority? If so, will it not be rendered too late? Can these questions be legislated for generally or are special measures to be taken in each case?

A few words on anti-airship guns. Technically they are almost perfect They form a necessary adjunct to the means of engaging aircraft, but their value must not be too highly estimated. They fire an explosive shell with percussion fuze and are intended for obtaining direct hits on the envelope and exploding the gas. Accurate ranging is essential for this, and tracers are carried in the base of the shell to assist the B. C. The range has to be found to a target travelling through the air at the speed of an express train, and this is obviously only possible at short ranges when the rapid rate of fire of the gun can be utilized during ranging. At long ranges the rate of fire during ranging must be slow because the arrival of the projectile at the target has to be awaited before correcting. The necessary informa-

tion as to the correction required at a particular instant which is deduced by watching the trail of the tracer past the target, is reliable only at that instant, for, at the moment of arrival of the next shot at the target the latter will occupy an entirely different position. I consider that fire from anti-airship guns with percussion fuzes against dirigibles moving at normal speeds has small prospect of effect at ranges over 3000 meters. At shorter ranges great destructive effect should be obtained, but against aeroplanes these guns have in my opinion no chance whatever.

The value of gun-carrying motor vehicles is much overstated; they are necessary in order to bring guns to points threatened by aircraft at short notice, and may under favorable conditions steal up to short range at the target, follow it within certain narrow limits and drive it away. Pursuit on a larger scale is impossible in peace time, and in war the presence of the hostile cavalry patrols or of hostile inhabitants will be sufficient to render maneuvers of single guns in front of the army a most hazardous enterprise. Furthermore, as soon as it discovers its pursuer churning up the dust of the high road, it will always rest with the aircraft to withdraw out of range by selecting a course which will leave the motor vehicle no practical road. As special weapons needing special ammunition, the anti-airship guns produce complications in the armament and equipment and render ammunition supply further involved, without giving a proportionate addition to the force of artillery available for an ordinary action. In case of necessity they might take their place alongside the field artillery in action against terrestrial targets, but this should be ordered with great caution as they would then be no longer available for their special rôle.

Even the armored motor gun lorries can be employed where immediate or sudden artillery fire is called for, but the value of a single gun must not be rated too highly. For decisive effect considerable numbers of guns must as a rule be brought into action.

Novelties, provided they do not involve increased labor, generally find ardent supporters, and this appears to be the case with anti-airship guns.

In conclusion, I will only express the hope that these special guns may be kept down to the absolutely necessary minimum numbers, and that the field artillery may be placed in a condition to engage dirigibles and aeroplanes effectively with their own weapons.—*Journal of the Royal Artillery*

NAVIGATION

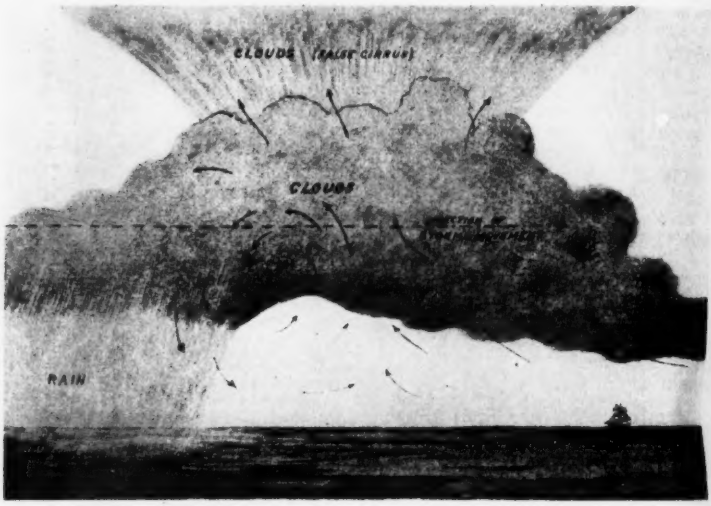
DETERMINING LONGITUDES BY WIRELESS TELEGRAPHY.—Commander H. A. Edwards of the Bolivian section of the Brazil-Bolivia Boundary Survey wrote from the river Abuna, Bolivia, on November 25, that it had been found possible to carry longitude by means of wireless telegraphy right into the heart of the Amazonian forests. Time signals have repeatedly been received from Mr. Atkinson at Porto Velho, the starting point of the Madeira-Mamore Railroad. Between Porto Velho, and the stations on the Rios Rapirran and Abuna there is no break in the Amazonian forests, but the signals were perfectly receivable in small clearings. Other signals were heard from Lima and Iquitos. The application of wireless telegraphy to expeditions for exploratory surveys opens up visions of new possibilities in which chronometers are relegated to a place of secondary importance.—(Condensed from *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 206-207.)

WIRELESS WEATHER REPORTS IN THE INDIAN SEAS.—With the rapid increase in the number and efficiency of the wireless telegraph stations on the coasts of India, it has now become practicable to issue daily weather bulletins by wireless to vessels over most of the Bay of Bengal and the north-eastern part of the Arabian Sea. Six coast stations are open day and night, and any vessel-master can obtain the weather bulletin from the nearest of

PHOTOGRAPH OF TWO HUGE ICEBERGS ENCOUNTERED BY THE REVENUE CUTTER "SENECA," IN THE LANE OF TRANSATLANTIC STEAMSHIPS

them on application. The importance of the new service is due to the fact that both of the seas in question are notorious for their cyclones. These are most frequent in spring and autumn, but are likely to occur at almost any time.—*Scientific American.*

Cross-section of a thundersquall (after Arrhenius), showing the circulation of air currents about a horizontal axis. According to Wegener, if the end of the whirl assumes a more or less vertical position it constitutes a "spout." A violent "spout" on land is a tornado.—*Scientific American.*



CROSS-SECTION OF A THUNDERSQUALL

GULF STREAM.—How far from Nantucket is the Gulf Stream? Has it been making to the eastward in the past decade?

Answer.—The inner edge of the Gulf Stream is about 90 miles off Nantucket the year round; but its outer edge is about 240 to 390 miles away, the width of the stream varying from about 150 miles in August to about 300 miles in February. Strictly speaking, not all of this is Gulf Stream, as much of the warm water on the outer edge is directly contributed by the Bahama Current, a warm stream that flows northwestward past the Bahamas and joins the Gulf Stream proper in about latitude 30°.

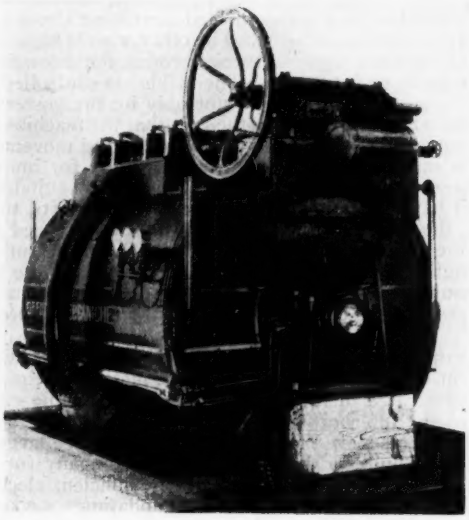
This office has no reason to believe that the Gulf Stream has changed its customary track. Whatever changes it may have undergone in the past are believed to be wholly temporary and due to temporary causes, such as varying winds, atmospheric pressure, and temporary increase or decrease in the Labrador Current, or rather in that branch of it which flows past our coast.—*Hydrographic Bulletin.*

MISHAP TO FRENCH WARSHIP.—A telegram from Cherbourg reports a singular mishap due to the stormy weather now being experienced in the channel. The Royal Mail liner, *Asturias* was carried by the sea so close to the French cruiser *Amiral Aube,* which was at anchor, that she cut the warship's anchor chain. The *Amiral Aube* was for some time in danger of being driven on to the breakwater, but this disaster was averted. Her stern, however, collided with one of the floating batteries, and some considerable damage was caused to her upper works.

The Maritime Prefect has ordered an inquiry into the affair.—*Central News.*

ENGINEERING

THE BELLUZZO STEAM TURBINE.—It has been stated (see last issue Professional Notes, page 550) that the Italian Government had made experiments with a new type of turbine which was said to constitute an improvement on any other type hitherto in use. We now reproduce an exterior view of this turbine, designed by Professor Giuseppe Belluzzo, of Milan. This turbine was evolved from an original land installation designed by Professor Belluzzo, which met with great success in Italy for power plant purposes. Various details of this turbine were incorporated in marine turbines for naval craft, notably of the Curtis type, the American licensees of which entered into an arrangement with Prof. Belluzzo. Eventually, the Italian engineer had constructed by the Officine Meccaniche, of Milan, a marine turbine of which the Minister of Marine authorized the installation in an old torpedo-boat, the *S 113*. The experiments were conducted a few months ago, with the Belluzzo turbine, illustrated herewith, installed on



HIGH-PRESSURE BELLUZZO TURBINE

board, and the results are reported to have been extremely gratifying. The torpedo-boat had a displacement of 79 tons and was fitted with White-Forster oil-burning boilers, using naphtha of 0.89 density. The *S 113* being a single-screw boat, 1 horse-power Belluzzo turbine and one l. p. turbine of the same type were mounted on the shaft. With a total horse-power of 1600 developed at full speed at 780 R. P. M., the fuel consumption was 594 grammes of naphtha per horse-power hour. At the reduced speed of 700 R. P. M., at 1080 horse-power, the consumption was 617 grammes, at the cruising speed of 360 R. P. M., at 190 horse-power it was 750 grammes. By using only the l. p. turbine, with three feeders out of five in action, the horse-power developed was 700 at 570 R. P. M., and the consumption per horse-power hour was 720 grammes. Reversing was effected in 13 seconds, with two-thirds of the total power developed. It was also found that it was possible to proceed at progressive speeds from the maximum of 1600 horse-power to the minimum of 190 horse-power, while the fuel consump-

tion of 594 grammes at full speed did not go beyond 750 grammes at the lowest speed, whereas the most modern Italian torpedo-boats consume 1200 grammes of naphtha at cruising speed. The turbine itself is of simple and robust construction. It is formed of two sections, one for high pressure and the other for low pressure. The high-pressure body has seven wheels, whereas in the low-pressure portion there are but two wheels and a drum. When at high speeds the steam acts on the first four high-pressure wheels and on the whole of the low-pressure system. At cruising speeds the steam acts on all the wheels. The three cruising speed wheels in the high-pressure have blades for movement in both directions, for both ahead and astern direction, in such a manner that when the engine is reversed the steam acts in the three last high-pressure wheels and in those of the low-pressure placed in the discharge. At cruising speeds, therefore, the "velocity steps" are increased and consequently also the efficiency of the turbine. Moreover, the construction of the wheels, which act at full power alone, is based on a new system of calculation originated by the inventor, by means of which but slightly different efficiency may be obtained when the speed of the wheel varies from 2 to 1, or from 2 to 0.7. The first high-pressure wheel has four series of blades, as have also the three wheels for the ahead and astern movements. The other wheels have all three series of blades. The blades are made of special bronze, the discs, drum and axles are of steel, the casings of cast iron. The turbine is controlled by one single wheel. The reverse speed is assured not only by the power at disposal—two-thirds of the whole—but also by the fact that the machinery responsible for the astern movement is united to that of the ahead movement, and being therefore at the same working temperature is ready for immediate action. Professor Belluzzo is now preparing plans for turbines suitable for a battleship, which will have the following features: Four shafts, the wing shafts at 240 R. P. M., the center ones at 300 R. P. M.; reverse speed as above, with two-thirds of the total power; external diameter of the turbines to be 12 feet and the lengths 36 feet for the inner and 23 feet for the wing turbines. The steam consumption would show a reduction, it is estimated, of almost half that now required at cruising speed.—*Shipping Illustrated.*

ECONOMY OF THE MODERN STEAM ENGINE.—The economies which have been secured in steam engine practice by the introduction of the steam turbine are strikingly illustrated in the installation which is being emplaced at the power station of the Interborough Rapid Transit Company, East River and Seventy-fourth Street, New York City, where the three largest turbines in the world are being built by the Westinghouse Company for the operation of the new subway. The turbines will supply sufficient electric current to operate 135 fully loaded ten-car trains accommodating 135,000 people. They are of the cross compound type, and consist of two sections, a high-pressure and a low-pressure unit. The high-pressure unit will receive steam at 200 pounds pressure, and will drive a direct-connected generator running at 1600 revolutions. The exhaust from the first unit will be utilized by a larger, low-pressure unit, running at 750 revolutions per minute. From this the steam will pass to the condenser. Each turbine will be direct connected to a dynamo which will deliver 30,000 kilowatts, or about 41,000 horse-power; and, at full overload, each machine can deliver 36,000 kilowatts, or practically 50,000 horse-power, for a short period of time.

The economies of the turbines, as compared with the existing reciprocating engines, are many and very large. The turbines occupy less space, weigh less, effect a large saving in lubricating oil, and call for a smaller operating staff. Thus the new turbines will require about 1645 square feet of floor space, representing an area measuring 31½ feet by 52 feet, and this is about the same as that occupied by the original reciprocating engines installed in 1901, which were illustrated at the time in the *Scientific American.* But although the space occupied is the same, the total output of power will be four times as great as that from the old plant.

The amount of steam used, and the enormous amount of cooling water required for the condensers, afford figures that are positively astonishing to the layman. Each unit will use about 350,000 pounds of steam per hour, and to condense this steam so that all the benefits of a vacuum may be obtained in connection with the low-pressure unit, each turbine must be provided with a condenser containing 50,000 square feet of cooling surface. To insure this the condenser will contain 36 miles of brass tubing 1 inch in diameter. The necessary amount of cold water for circulation through the tubes will be drawn from the the East River, and through each condenser there will be passed every hour 4,500,000 gallons of water. To pump this amount of water through the condensers for the eight units which will be ultimately installed calls for a tunnel 12 feet 4 inches wide and 12 feet 4 inches in height.

The saving in the coal bill by the use of turbines is truly remarkable. In the old cross compound reciprocating engine only 17½ per cent of the heat evolved by the combustion of the coal was turned to practical use, or as the engineers say, the thermal efficiency was only 17½ per cent. Moreover, 17 pounds of steam had to be consumed to deliver 1 kilowatt of power for one hour. With the new cross compound turbines a kilowatt of power will be secured on a consumption of 11¼ pounds of steam per hour. Under the present operating conditions 300,000,000 gallons of water are turned into steam every year for the use of the reciprocating engines. The new turbines will do the same work on 200,000,000 gallons of water with a corresponding reduction in the amount of coal that must be burned on the grates of the boilers.—*Scientific American.*

OXY-ACETYLENE TORCH.—Successful trials are reported to have been made in Germany of the use of the oxy-acetylene torch for removing the scale from boilers. The deposit is immediately removed without the plate undergoing any alteration. This process is now universally available owing to the low price of oxygen.—*The Engineer.*

THE ALBACORE EXPLOSION.—Artificer-Engineer Henry Guildford stated that steam was being got up preparatory to the vessel leaving for Sheerness, when it was reported to him that a tube had burst in one of the water-tube boilers. He immediately went to the boiler-room hatch and found that the forced draft fans were going at full speed, and steam was escaping from No. 1 funnel and also from the safety valves of Nos. 1 and 2 boilers. A message was sent through a voice tube to the boiler-room, but no answer was received. Witness then opened the hatch, and went into the boiler-room. The three men who were in the room were on the port ladder, and he first saw that they were attended to. Witness allowed the steam to die down, and then examined No. 1 boiler. He found that a tube had drawn from the top barrel, in which it had been secured by a nut. This caused the steam to blow out into the boiler-room. Replying to questions, witness said other tubes had drawn in this particular type of boiler, and the Admiralty had been unable to ascertain the cause. Had the accident occurred at sea the steam would have been driven up the funnel by the fans, and the men would not have been injured. The men were not exposed to the steam more than two or three minutes. The steam pressure was 175 pounds. On April 1 the boiler was tested at a pressure of 250 pounds. Witness could advance no theory as to the cause of the accident except that the nut had been forced from the thread.—*Naval and Military Record.*

OIL-FUEL ADVANTAGES.—The First Lord of the Admiralty has issued a memorandum from Lord Fisher, the Chairman of the Royal Commission on Fuel, in which the following summary of the unanimous views of the commissioners is set forth: (1) The advantages to be derived from the use of oil fuel and the imperative necessity for such use if the fleet is to be maintained in a condition of highest attainable efficiency are conclusively

established by the commission's first interim report; (2) the commissioners are of opinion that the oil resources of the world are amply adequate to meet the requirements of the fleet if suitable measures are taken to secure supplies; (3) large reserves should be accumulated in this country and at certain other storage centers on British territory. The extent of these reserves should bear a prescribed relation to the consumption under peace requirements, as this will give a definite basis.—*The Engineer.*

OIL PRODUCTION OF MEXICO.—Mexico now holds third place in the list of oil-producing countries. Its annual output amounts to about 18,000,000 barrels, and is exceeded only by that of the United States and Russia. The exports for 1913 will probably amount to 17,000,000 barrels (*Daily Consular and Trade Reports*, October 11, 1913). Mexican oil is much used for fuel purposes. At Manchester, England, tanks for the storage of over 8,500,000 gallons of Mexican oil have been provided. The liquid fuel is distributed by tank cars to plants in Lancashire, Cheshire and the Midland counties. It is also sold to oil-burning vessels. During 1913 a considerable quantity was delivered at Batum for the account of the Transcaucasian State Railways Company. The Mexican oil fields extend along the entire Atlantic coast. They have been best developed near Tampico and Coatzacoalcos.—*Geographical Record.*

The Paris Admiralty has decided, after a series of comparative experiments, to give up the use of large tube boilers, which, though possessing valuable qualities, occupy too much space relatively to their rate of combustion and steam production. Whereas the 23,600-ton *Bretagne* and *Lorraine* are fitted with large tube Bellevilles, and the *Provence* with large tube Niclausses, the 25,300-ton *Languedoc*, *Normandie*, and *Gascogne* are to receive small tube Normands or Guyots, whilst the *Flandre* and *Béarn* are designed for Bellevilles and Niclausses respectively, but of a new type, with smaller tubes, made with a view to high combustion (over 225 kilos per square meter of grate). To this innovation is due partly the excellent utilization of the displacement in our quadruple-turret ships.—*Engineering.*

THE FÖTTINGER TRANSFORMER.—It is reported in engineering circles that the Föttinger transformer is being largely adopted in connection with the machinery installations of new warships. The Vulcan Company are fitting it in the new Imperial yacht, *Ersatz Hohenzollern*, of 30,000 horse-power, in the light cruiser *Ersatz Gefion*, of 45,000 horse-power, and in three German destroyers, with a total of 75,000 horse-power. The same firm is manufacturing transformers for Messrs. Yarrow & Co., to be fitted in two Japanese destroyers, and for the three Chinese fast cruisers building at Trieste.—*Engineering.*

AUTOMATIC FOG-SIGNALLING GUN.—There has been in the last few years a successful development in various parts of the world of the automatic acetylene attended lighthouse, originally established in 1901 in Scotland by Messrs. D. and C. Stevenson, M. M. Inst. C. E., Edinburgh, and which marked an important step in lighthouse engineering. A further advance has now been made by the introduction of the automatic fog-signalling gun, also worked by acetylene.

As the results of many experiments carried on since 1909, Messrs. Stevenson and Messrs. Moyes & Sons, Acetylene Engineers, Glasgow, have evolved an automatic explosive signal which has proved reliable and economical. In the summer of 1910 a small gun arranged to fire three shots per minute was fitted to an acetylene buoy off the Island of Inchkeith, in the Firth of Forth. It worked continuously, night and day, for two months, and the consumption of acetylene gas was about one cubic foot per hour. On a heavy misty day the report from this gun could be heard at Granton,

a distance of about four miles from where the buoy was moored. Another gun, somewhat larger, fitted on Fort Matilda Pier on the Clyde, has been heard on a calm foggy day at Craigendoran, about five miles away.

The gun is worked entirely by the action of acetylene gas and is simple in construction. Hence, the risk of its getting out of action is practically *nil*. Free air and acetylene gas are in certain proportions forced into a collecting chamber where they form a highly explosive mixture. When a sufficient quantity has collected, it is ignited by means of an apparatus specially designed and patented by Messrs. Stevenson and Moyes. The consumption of acetylene gas in the case of the larger gun set to fire two shots every thirty seconds, is about three cubic feet per hour; it will thus be readily understood that the running costs are very low. The gun gives

AUTOMATIC FOG-SIGNALLING GUN

a sharp report, which can be heard at a distance of from three to ten miles, according to the size of the gun. The guns may be supplied with gas, either from cylinders of dissolved acetylene or from a generating plant, according to whichever may be considered the more suitable for the station where the gun is to be established. The guns are fitted up and housed in strong cast-iron sheds with a cast-iron lean-to shelter that can be attached to enclose the cylinders or generating plant. A larger gun is at present being completed which can be heard at a distance of nine or ten miles; in this gun the consumption of gas is proportionate to the guns already mentioned.

Messrs. Moyes and Sons, who are the contractors and sole makers, have erected these automatic guns at Dhu Heartach, Cantick Head and Devaar lighthouses and at Fort Matilda pier; and many more have been ordered by the commissioners of northern lighthouses, the Clyde Lighthouses Trust, and the United States of America Lighthouse Department.

The gun at Fort Matilda pier is switched on and off by wireless from Gourock Pier, the wireless arrangement having been fitted up by Messrs. Marconi's Wireless Telegraph Co., Ltd., to the order of Messrs. D. and C. Stevenson.

The gun is very suitable for exposed situations, as it can be left firing continuously for several months without attention, or can be turned on and off either by electric cable from shore or by wireless installation. Several guns stationed at exposed places, have been left out of action for three or four months, after which, being switched on, they started right away.—*Page's Engineering Weekly.*

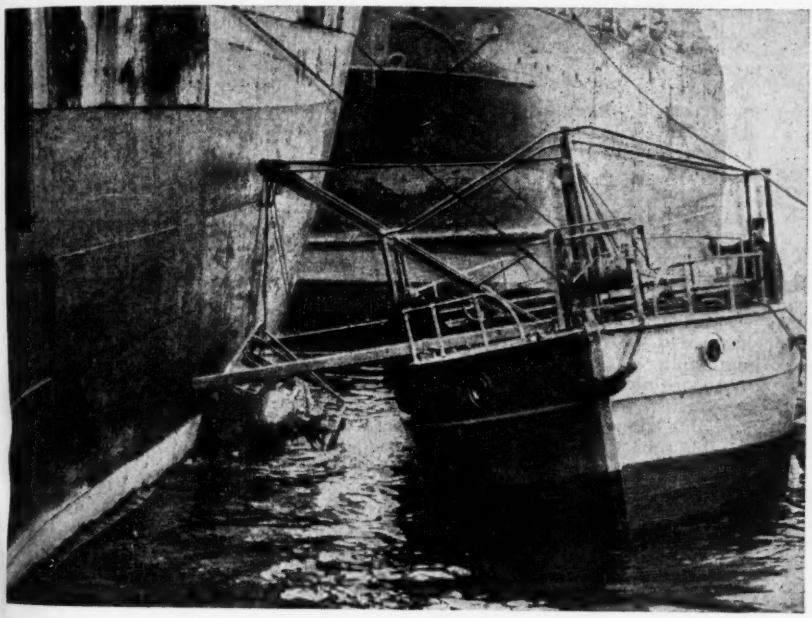
SUBSTITUTE FOR SEARCH-LIGHTS.—Experiments with a new method of illumination for warships at night were tried recently by the German battleship *North Sea*, with the object of finding a substitute for a search-light which will not disclose the source of the illumination. Tubes filled with calcium carbide were fired into the sea from a specially constructed gun. When they rose to the surface the carbide changed to acetylene gas by contact with the water. The gas automatically lighted, gave a flare of more than 1000 candle-power.—*Army and Navy Journal.*

FOUR ONE-THOUSAND-FOOT DRY DOCKS BUILT AND BUILDING.—There are now four dry docks of 1000 feet in length built or under construction. The Gladstone Dock, 1000 feet long, has been completed at Liverpool. Another is being built at Quebec, and a third at Boston. Last month the Hughes dry dock at Bombay, India, 1000 feet long, 100 feet wide, with a depth of 30¼ feet, was opened.—*Scientific American.*

The Navy Department has at last secured a machine which it is believed will do much toward solving the broken shaft problem. Some time ago after an exhaustive examination the conclusion was reached that broken shafts were the result of vibrations rather than of extraordinary strain on the material of which they are made. The theory that the breaking of shafts is the result of flaws in the steel is almost universally discarded. Experts are convinced that the most perfect shaft will crack if it is turned at a speed which creates vibrations that gives it a sort of whip. The curious feature of it is that no two shafts vibrate to the danger point at exactly the same number of revolutions. It has been found, for instance, that if a shaft vibrates say, at 50 revolutions it will stop at 51, and is not apt to begin to vibrate until it has passed the speed of 49 revolutions. Again, it will vibrate a second time when it reaches 100 revolutions. Every shaft seems to be a law unto itself and must receive special treatment. To determine at how many revolutions the vibrations of the shaft reach a dangerous point is the purpose of a new machine which will shortly be tried out in the navy. This machine when attached to a shaft makes a record on a piece of paper which indicates the vibrations of the shaft. At the same time it keeps a record of the number of revolutions, and by running the engine of the ship at various speeds it is expected to obtain a record which will indicate at how many revolutions the vibrations of the shaft become dangerous and are liable to break it.—*Army and Navy Journal.*

A SUBMARINE SHIP-CLEANING APPARATUS.—An interesting apparatus for cleaning the hulls of ships without the necessity for dry docking has recently been introduced into this country by the Submarine Motor Ship Cleaner Company, Limited, which is an Australian company registered in Melbourne. Its London offices are at 66, Broad-street Avenue, E. C., and Cecil Chambers West, 76, Strand, W. C. A demonstration of the working of the apparatus was given recently when, by permission of Messrs. Siemens Brothers & Co., Limited, it was applied to the cable-laying steamship *Faraday*, lying in the West India Export Dock. Some idea of the speed of working of the apparatus will be given when it is stated that by means of it the *Faraday*, which

is a 5000-ton ship, 360 feet long, could be cleaned in some four or five hours. This would be with the employment of one plant only. Although the short time required to clean a ship is a valuable feature of the apparatus, it is not its main claim to consideration. Of greater importance is the fact that the cleaning can be carried out without dry docking and during working of cargo. This naturally saves graving-dock dues, which are always heavy, and in some parts of the world very heavy, and enables the cleaning of a ship to be carried out in harbors where no graving-dock accommodation is available. These advantages would make it possible, in most cases, to confine the dry docking of a vessel to the time of her annual overhaul, and at the same time to clean the hull some three or four times a year, so that all the advantages of increased speed and coal-saving which a clean bottom ensures



CLEANING A SHIP'S HULL WHILE AFLOAT

would be retained. The cleaning apparatus itself is self-contained, and all carried on a barge, and is quite independent of the ship which is being cleaned. The only connection between the barge and ship consists of fore-and-aft ropes, which are carried from the ship to crab-winches on the barge. They are used to propel the barge along the side of the ship as the cleaning progresses. The barge carries a jib at one side from which a cleaning-brush is suspended. This brush, which is of bristles, is cylindrical, and much on the lines of the brush of an ordinary road-sweeper. It is mounted horizontally on the frame of a waterproof electric motor which drives it through a chain-gear. A propeller is also mounted on the motor frame, on the opposite side from the brush. The method of operation is to lower the whole arrangement overboard from the barge by the jib. The motor is then started, and the propeller pushes the brush against the side of the ship. The motor is lowered and lifted by a winch with four drums. Two of these carry the motor ropes, and another the cable supplying current. These three

drums work in unison. The fourth drum is independent, and is used for raising and lowering the jib. The brush, as it rotates, is lowered by means of the winch, and so cleans a vertical strip of the ship's side 5 feet wide, that being the length of the brush; it is then lifted, and the barge moved along for about 4 feet, and a second strip cleaned in the same way. The barge is not moved the full length of the brush, in order to leave an overlap, so that no part of the hull may be missed. The time for cleaning one strip, including the moving of the barge, was about 2 minutes at the demonstration on the *Faraday;* but we can well believe that with a practiced crew time might be considerably cut down. Proper distance between the barge and the ship is maintained by two projecting booms carried by the barge. The brush motor is 10 horse-power, and works at 230 volts. The brush runs at about 160 revolutions per minute. The weight of the under-water gear is about 800 pounds when out of the water, and 280 pounds in the water. It is fitted with floats. The lifting-winch is driven electrically from a 28-horse-power petrol-engine generating set on board the barge. The average speed of lowering the brush-gear is about 45 feet a minute. This speed can be varied between 35 feet and 70 feet per minute if desired. The barge has a propelling motor, by which it can be driven at about 5 knots. The plant shown was supplied by Messrs. Bruce Peebles & Co., Limited, Edinburgh.—*Engineering.*

SUBMARINE SALVAGE.—Since submarine *A 7* met with disaster off Plymouth last January, reports have appeared from many quarters of experiments with appliances invented with the object of raising sunken submarines and succoring the crews of such vessels until they can be brought to the surface. At Venice the submarine *Narvato* was sunk in a lagoon to a depth of 70 feet, and within an hour from the time the salvage party left for the scene the vessel was raised, new plant being used for the purpose. Tests have also been made with improved systems of telephoning and hammer signalling.

According to the U. S. Consul at Havre there has been invented there an apparatus which enables a hollow globe to be released from a sunken vessel and this globe then rises to the surface, carrying a hawser, by which a flexible tube, one end of which is attached to the submarine, may be lifted, and fresh air thus supplied to the imprisoned crew.

With models of another invention, described as Clark's Life-Saving Apparatus for Submarines, a demonstration has been given in a swimming bath in London. According to *The Morning Post* the main feature is the provision of one or more wells in a submarine, into which is fitted a cone-shaped vessel. The size of this may be varied, but the intention is to provide a means by which a crew, when a submarine is disabled, may escape to the surface. The steel cone is to be entered from the submarine, and when the men are there, a lever is pulled over, which opens a series of sea cocks and allows a body of water to pass between the cone and the containing well. This pressure of water forces out the cone from its receptacle, and it rises to the surface. Arrangements are made for opening a conning-tower in the upper part of the cone or buoy, and provisions and water can be stored for at least a week. The models were sunk in 7 feet of water, and the life-saving cones were released by operating a miniature motor. One model was on a large scale, and the other showed a submarine with two of these safety cones. All three left the sunken vessels and rose buoyantly to the surface.—*Naval and Military Record.*

AVIATION

ONE THOUSAND AEROPLANES.—Representative L'Engle has introduced a bill (H. R. 13,812) to provide adequate means for aerial national offence and defence. It authorizes the Secretary of War and the Secretary of the Navy to purchase, equip, and maintain in the most efficient manner one thousand aeroplanes of the highest type of efficiency, with the necessary accessories, including buildings for housing and protecting same, flying and maneuvering grounds, and schools of instruction, to fully meet the exigencies of any demand that may be made upon the service, and $15,000,000 is to be made available. The army and the navy are to have equal division of the aeroplanes.—*Army and Navy Register.*

"ILYA MUROMETZ."—The Russian naval authorities have purchased M. Sikorsky's giant aeroplane, the *Ilya Murometz*, which has been making a series of successful flights with as many as 16 passengers, and has established several world's records in aviation. The *Ilya Murometz* will go to Libau, and will be transformed into a hydroplane. M. Sikorsky has received an order for five more of his machines. On one of them he will fly experimentally from St. Petersburg to Kieff, via Moscow and Harkoff. —*Army and Navy Journal.*

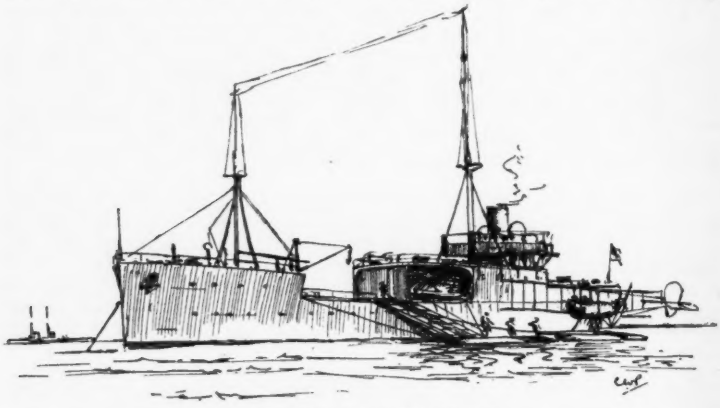
GERMAN WAR AEROPLANES.—Commenting on the German aircraft works (*Deutsche Flugzeug Werke*) the London *Daily Telegraph* remarks:

"Of the strength of the German aviation establishment there is no longer any question; judging from reliable reports, it is now even greatly superior to that of France. In one center only—that of Doeberitz—there are actually 200 war machines ready for instant mobilization and prepared in every respect to take the air at once. But it is the type of machine and its qualities that are of interest, for these in a measure reflect the policy of the German aerial force, and they may be studied with advantage.

"In the first place, it is evident that speed in this case only forms a secondary consideration. Reliability and endurance are the principal results aimed at. With few exceptions German and Austrian aeroplanes have their wings swept back; in other words, seen in "plan" view they present the shape of a wedge, with the point forward in the direction of flight. This characteristic feature has earned them the title of 'arrow' biplanes and 'dove' monoplanes. Further, the wing-tips are usually up-tilted, a feature which in conjunction with the wedge shape produces some degree of automatic stability while leaving full control to the pilot. In this respect the arrangement differs from that of the *Dunne*, where stability is inherent and the pilot can exercise but little control. The intention is simply to relieve the pilot from the continuous strain imposed upon him in long cross-country flights. That it is successful in this respect has been proved time and again during the past few months by the remarkable long-distance flights made by various German pilots, of which the wonderful performance of Stoeffler, who covered 1290 miles in 24 hours, may serve as an example. Save for the maneuvers of steering, the pilot of such an aeroplane has little need to bother about controlling his machine, with the result, first, that the physical and mental strain to which he is subjected—and only those who have flown continuously for several hours at a stretch can realize the intensity of this—is practically eliminated, and, secondly, that he is thereby free to devote himself to other duties, such as that of observation.

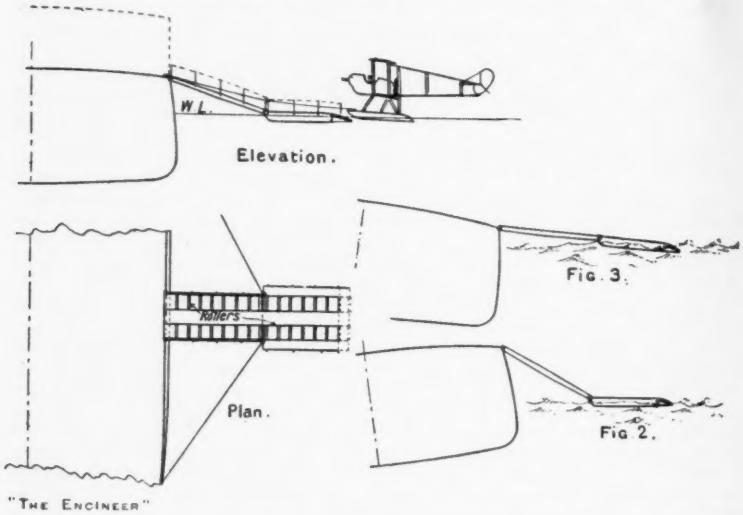
LAUNCHING AEROPLANES FROM SHIPS AT SEA.—There have been many methods suggested for launching aeroplanes from ships and for embarking them whilst at sea. They are as follows: (1) The aeroplane was intended to alight upon a special platform on the ship, either a per-

manent or temporary structure. It was also intended to depart therefrom. The objections to this method are many and quite obvious. (2) The aeroplane was to run along a wire rope, or be shot off a rail, and either (*a*) be picked out of the sea by derricks, or (*b*) to fly under a wire rope



APPARATUS FOR BOARDING

and catch hold of it by means of hooks. This latter is the feat of an acrobat, and is then only possible if the ship is not oscillating, whilst the former is dangerous and not desirable. (3) The aeroplane was to be



"THE ENGINEER"

APPARATUS FOR LAUNCHING SEAPLANES FROM SHIPS

lifted bodily on to the surface of the water by derricks or the like, from which it would rise in the ordinary way. This method would be slow and clumsy, and would not be good for the aeroplane, and in anything of a sea would be positively dangerous, owing to oscillations of the ship.

In the method here described and illustrated—for which a patent has been taken out—the aeroplane or seaplane is launched and embarked in such a manner that oscillations of the ship would not be dangerous. It may be said by some that it is desirable to launch hydro-aeroplanes directly from the ship when the water is too rough to rise from. This certainly is true if the aeroplane cannot be designed for both a high speed—necessary for the high wind corresponding to a rough sea—and for a big lift for getting clear as quickly as possible—in one wave length, say. Even if it is possible to launch them directly—and this is not at all certain—it is obvious that some such method as is here suggested will be necessary in order to regain the ship. One hopes, however, that great improvement will soon be effected in the design of floats for rough water, and this will solve the difficulty to a large extent.

The illustrations show a floating pontoon with an aeroplane about to be "beached," and then drawn up the bridge to the deck. This bridge or gangway is hinged both to the ship and to the pontoons by detachable hinges. The sketches show what would happen if the vessel were rolling in a seaway, and provided the period of roll were made fairly long, there would be ample time to take advantage of the level phase—Fig. 3—to haul the aeroplane on to the deck.

The rollers in the way of the floats would facilitate hauling up and launching with speed. The whole apparatus could be stowed away on board when not in use, and would fold up, and be lifted on board by derricks. If the apparatus were fitted to the stern of the ship, the amplitude of pitching in a sea from which it is possible to launch aeroplanes would be slight.—C. W. PIDCOCK.—*The Engineer.*

FUNCTIONS OF THE SEAPLANE.—It is satisfactory to learn that out of the 103 heavier-than-air machines possessed by the navy 62 are seaplanes. It is generally believed that the seaplane has a great future before it, and it is but fit that this country should lead in the number and efficiency of these machines, as well as in the experience required to make them do their best. Other countries are behind us, and, as Mr. Churchill says, we are without doubt in numbers, in quality and in experience, far in front of any other nation in seaplane work. This is flattering, but it is also vital to a country which can only exist by its supremacy in all things connected with the sea, no matter whether it be in the realm of war or commerce, in the air, on the surface of the sea, or under the waves. The seaplane, the battleship or liner, the submarine, or the homely "tramp," are all first class essentials to the mistress of the seas. The seaplane has become a great asset, not only in scouting, because they are so much faster and safer from attack than cruisers, but they are among the most formidable obstacles to those who would attempt to raid our coasts. From eerie heights the airman can espy the approach of an armada loaded with troops, and with his wireless apparatus he can inform the coastguards, who will forward the news to the patrol flotillas of torpedo craft laying in leash at their respective strategical centers and summon them to the spot threatened; meantime, the seaplane itself can drop disturbing, demoralising and dangerous bombs upon the fleet of troopships during their approach and the work of disembarkation, until the destroyers arrive and sink or capture the whole armada.—*United Service Gazette.*

"FOOLPROOF" BIPLANE.—Asst. Naval Constr. Jerome C. Hunsaker, U. S. N., who is on special duty at the Massachusetts Institute of Technology, was observer and passenger in an aeroplane flight at Marblehead, Mass., on March 25. It was a test of the Dunne biplane intended to show that it is a "foolproof" machine that cannot be upset by a careless or inexperienced operator. So far the experiments have been promising, press reports state. When 800 feet high Clifford L. Webster, who was driving the machine, stopped his engine and took his hands from the

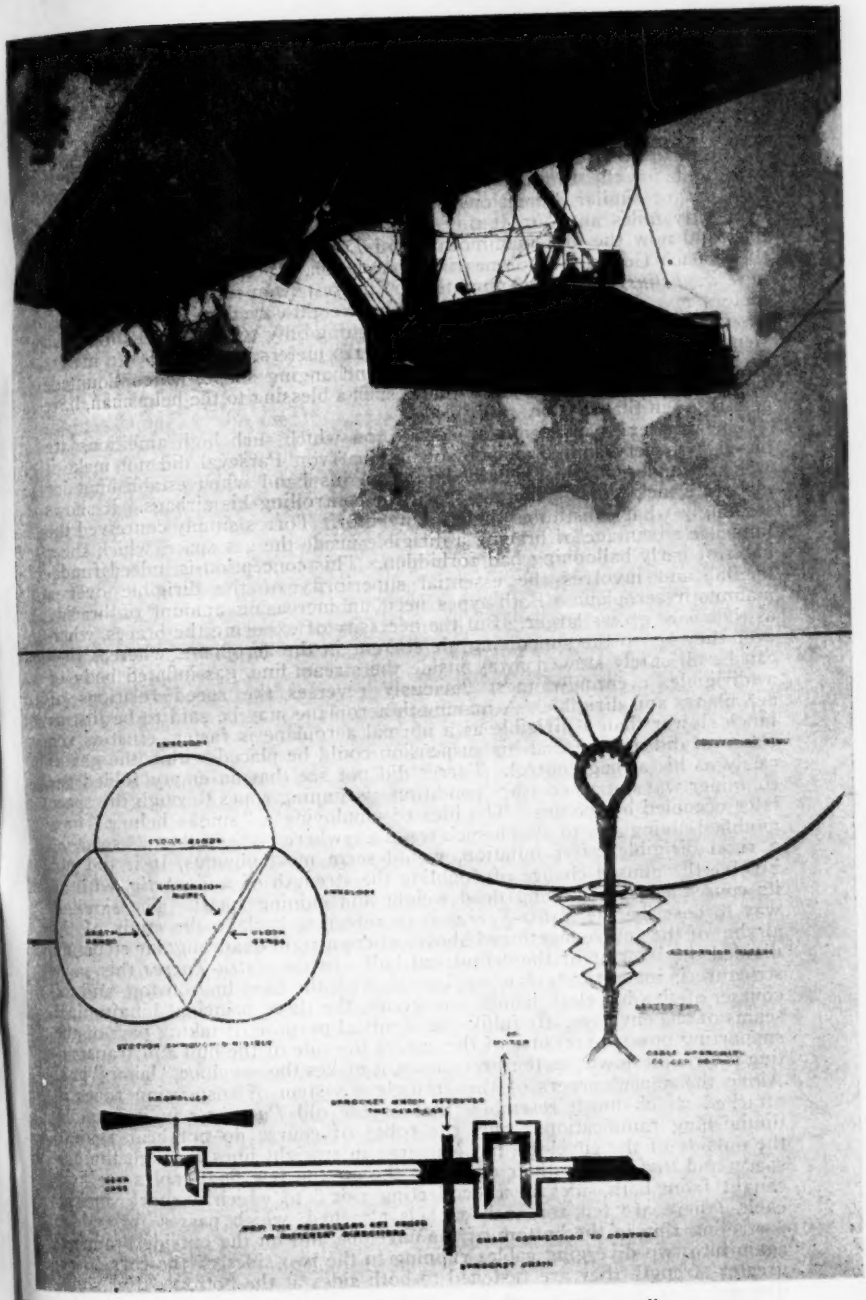
control levers. The machine immediately assumed a flat, gliding angle and coasted down to the surface of the water wholly without guidance. When only a yard or two above the water the pilot straightened out his craft and landed gently. Mr. Webster had previously put the aeroplane through paces with Constructor Hunsaker as a passenger.—*Army and Navy Journal.*

THE BIGGEST OF FRENCH DIRIGIBLES, by Carl Dienstbach.—One of the most vexing problems of aeroplane design is to minimize the air-resistance of the many bracing wires or cables. In dirigible design inventors originally worried still less about the ropes by which the car was suspended from the gasbag than early aeroplane experimenters about the "wiring" of flying machines, both laboring under the erroneous impression that compared with the supposedly enormous resistance a balloon or even a large plane offered to propulsion, that of a thin rope or wire was trifling. Modern aerodynamic research has changed this view. Air in motion has been photographed, and it has been discovered that around a properly shaped balloon or plane air will so smoothly part and close again that it will escape easily without impeding the moving body. But a rope or wire will always push the air along bodily. Who has not wondered about the grip of the wind on an ordinary signal halyard, if one tries to straighten its curve by pulling? In the wake of a long thin cable the wind is all broken up into eddies, and if there is a bundle of wires or ropes, this effect is so aggravated that the air seems to be eventually "raked" along almost like so much hay. Practice has proved this no less than theory. When the writer once complimented Major von Parseval on the picturesque appearance of his "full-rigged" airship, he protested that the waste of power due to this very beauty was extravagant.

Little attention was at first paid to the fact that even in the first rigid dirigible of 1900 Count Zeppelin had incidentally reduced this trouble to a minimum. It was little wonder that no sooner did the *Zeppelins* cease to remain badly under-engined compared with other dirigibles of corresponding displacement, than they began to attain speeds undreamed of in "lighter than air" machines. By an ingenious improvement of the original suspension the *Parsevals* soon managed to follow suit to a degree, because their outlines, showing only envelope and one small car, were also simple. But French designers, clinging to unpromising types of large suspending stiffening frames, never equaled German speeds. Not even in details did they betray an attempt to reduce resistance against propulsion, a photograph of a French car showing a veritable jungle of exposed framing.

Germany's *Gross-Basenach* type of army design, though its suspended stiffening frame was carefully incased in cloth and made of a slender streamline shape from the outset, has on the other hand recently fallen into a certain disrepute. French manufacturers faced no easy problem when the government called on them to equal the speeds of *Zeppelins*, finally realizing that strong as they were in aeroplanes, an entire absence of speedy dirigibles might be fatal.

While experiments with a French rigid airship, the *Spiess*, essentially a frank Zeppelin imitation, were progressing with a slowness dictated by the fate of the British *Mayfly*, the Spanish engineer Torres came to the rescue. Some ten years ago he invented a fundamental improvement in non-rigid airships. Laboring under the inherent difficulty of the tremendous outlay required to demonstrate a new idea in dirigibles on a scale large enough to be conclusive, which only Zeppelin was able to conquer, he offered his invention to the French Astra Company, after a futile attempt at embodying it in a Spanish dirigible of pygmy dimensions. They tried it at least on a practical scale by building after his plans one of the small so-called "vedettes" (short-range scouts) for the army, of some 1500 cubic meters displacement. The result was an unqualified success. The modest "vedette" was able to play with the big crack cruiser *Colonel Renard*, of



DETAILS OF THE MAMMOTH "ASTRA-TORRES"

Her gas capacity is 23,000 cubic meters. Her engines deliver 1000 horse-power. Her length is 100 meters. The gas bag is braced within by cloth bands. This bracing transmits part of the supporting upward pressure of the gas straight down. A system of suspension ropes leads down from this bracing, the ropes being first caught from both sides in a collecting ring to which a short vertical cable is attached which passes through a gasket in the bottom of the envelope.

over 3000 cubic meters, which had won the race for dirigibles at the first aeroplane meet at Rheims.

The next *Astra-Torres* was not lacking in size (8000 cubic meters). It was built for the English Government simultaneously with an advanced *Parseval* of similar dimensions, which it easily surpassed, developing well over fifty miles an hour at the official speed tests. This lesson was not lost, and now the first mammoth *Astra-Torres* of 23,000 cubic meters for the French Government is nearing completion. It is expected to beat the new *Zeppelins,* because it mounts 1000 horse-power engines on 5000 cubic meters less displacement, thanks to the weight saved in dispensing with the rigid frame (the whole structure weighing only 16 tons), yet the rakish slenderness (the *Astra-Torres* measures 110 meters in length by 19 meters greatest beam) of a rigid hull and its unchanging shape, which Count de la Vaulx, in piloting the *Spiess,* found such a blessing to the helmsman, have also a say in that matter.

The wonderful invention of Torres, on which such high ambitions are based, was very simple and obvious. That von Parseval did not make it was a wonder, as be virtually had it in his hand when establishing his elaborate tackle inside the gas space for controlling his airbags. It shows strikingly what constitutes the true inventor. Torres simply conceived the immense advantage of bracing a dirigible inside the gas space, which sheer habit of early ballooning had forbidden. This conception is indeed fundamental and involves the essential superiority of the dirigible over a mammoth aeroplane. Both types need an increasing amount of bracing as their size grows larger. But the necessity of exposing the braces, whatever they be, to the supporting air current in the aeroplane, whereas they can be all safely stowed away inside the stream-line, gas-inflated body of a dirigible, eventually most curiously reverses the speed relations of aeroplanes and dirigible. A mammoth aeroplane may be said to be just as much slower than a dirigible as a normal aeroplane is faster. Just as von Parseval did not see that his suspension could be placed within the gas as easily as his airbag control. Torres did not see that an empty folded gas container was not a necessary condition of running ropes through the space later occupied by the gas. The idea of employing a "smoke helmet" or a modified diving suit to attach such ropes anywhere right in the gas space of a rigid dirigible, after inflation, would seem most obvious, if it did not involve the unused chance of doubling the strength of a *Zeppelin,* with all its consequences of saving dead weight and gaining speed. The simplest way to describe the *Astra-Torres* is in referring back to the study of the airship of the future mentioned above, where a rigid quadrangular structure divided the interior of the cylindrical hull. In the *Astra-Torres* this same structure is made triangular, equilateral, with the base line on top, and, of course, of flexible cloth bands, connecting the three principal longitudinal seams of the envelope. It fulfils the identical purpose of taking part of the supporting upward pressure of the gas off the side of the hull and transmitting it straight down; as the French say, it makes the envelope "labor" less. Along the upper corners of this triangle a system of suspension ropes is attached which much resembles that of the old *Parsevals* in its rapidly diminishing ramifications; only the ropes of course do not bear against the outside of the envelope, but converge in straight lines through the gas space, and to facilitate their egress to the air the few final cables are first caught from both sides in a "collecting ring" to which a short vertical cable (there are ten for each car) is attached, which passes through a protecting ring in the bottom of the envelope and on the outside branches again into two diverging cables running to the two sides of the cars. For greater strength they are fastened to both sides at the bottom. For some distance they are incased in an "accordion" sleeve or hose outside the hull, which communicates with the gas space and is glued to the cable at its sealed lower end, preventing escape of gas under pressure, yet permitting that amount of play for the cable which is necessary in a flexible, elastic structure.

The internal bracing being too simple to keep the envelope cylindrical (a more complicated system might be in imminent danger of getting entangled while the empty envelope is laid out for inflation), the hull of the *Astra-Torres* shows the characteristic shape of three separate bulging ridges, giving an unpleasantly large outside surface, which, with its frictional resistance, is regarded as a lesser, necessary evil. Attaching ropes after inflation would obviate it. The general outlines, two cars with stiffened funnels through the envelope to observation and gun platforms on top (riding there on a sort of "saddle frame"), the concentration of all steering and stabilizing planes at the poop of the hull, are obvious adoptions from the *Zeppelins*, while the accompanying detail of a car shows the best features of Parseval practice, such as two motors for each "Chenue," of 250 horse-power each, each driving its own screw, improved propeller mountings of small air resistance. There is the well-tried Astra spring mounting for the motors and the convenient Astra "bridge" for the captain and his staff, but it is incased and decked over like all of the car, which shows also general stream-lines, and has a pretty, windowed observatory with a searchlight in its nose. A machine gun is to protrude through a gun port in the side—rather an antiquated practice. The engine room in the center contains auxiliary machinery—a ventilator for the ballonets, and dynamos for electric lighting and the wireless, of which the instruments are carried in the observatory in the nose. The Astra plant has also worked out an efficient system of swiveling propellers, to be installed in their next leviathan. This plan has given great satisfaction on a small scale in England, but will eventually become of vital necessity, as no force of men could handle a mammoth dirigible so efficiently and economically on the ground in landing and starting as 1000 horse-power applied to a swiveled propeller. Theoretically it would take a handling crew of 2000 men to equal it.—*Scientific American.*

The new Italian dirigible *G 1* is to be of 40,000 cubic meters' capacity, and will thus be the largest rigid airship in the world. She is designed for a speed of 95 to 100 kilometers per hour.

A NEW FRENCH MOTOR.—The new Paris-built aeroplane motor known as "E. J. C." differs from the usual types because it uses a double propeller, that is, two separate propellers rotating in opposite directions. The motor is of the kind in which the crank-case and six radial cylinders rotate in one direction, while the crank rotates in the other by mutual reaction alone. One double-blade propeller is keyed on the crank-shaft and another of the same kind, but with inverted thread, is mounted on the body of the motor, one screw being just back of the other, and the pair taking an X-shape when seen from the end. The screws are designed so that motor body and shaft take the proper speeds which are needed, there being 800 revolutions per minute for the motor and 1200 revolutions per minute for the shaft, making a total of 2000 revolutions per minute. But as the speed ratio varies with the running speeds, a differential is used inside the crank-case, so as to regulate the speed in the proper way. The present motor is of 60 horse-power size.—*Scientific American.*

MECHANICAL FLIGHT MADE SAFE.—Before a deeply interested audience at the First Parish Chapel on Sewall Avenue, Mr. J. Emery Harriman, of 761 Washington Street, Brookline, delivered a chalk talk on "Mechanical Flight," that in the years to come will undoubtedly be referred to as one of the epochs in Brookline history.

When a man, trained as an engineer, propounds certain theories, generally in technical terms, the average audience is thrilled for the moment, but the effect is not lasting. Such, however, was the reverse in this case, for Mr. Harriman's earnest belief and convincing arguments carried with them much food for thought, even for the most skeptical.

The theories which he propounded were so simple when explained, and so brim full of common sense one wondered why the same theories had not before been carried out in practical application. And these selfsame ideas are not new, for Mr. Harriman applied for his first patent in February, 1904, more than two years prior to the first announcement of mechanical flight by the Wright brothers to the Aero Club of America.

Mr. Harriman referred to the millions of dollars that have been spent in promoting the art of flying, thousands of machines that have been built and destroyed, hundreds of lives that have been lost in redemonstrating the principles as laid down by the Wright brothers, giving credit to these men for the wonderful records that have been made in speed, altitude, distance and endurance in machines of rigidly-fixed-horizontal-wing type. He gives the Wrights credit for demonstrating the fact of mechanical flight, but states that here all credit must end for the four essentials to the future flying machine, he has proven beyond doubt, *must* be Equilibrium, Stability, Control and Adaptability.

Mr. Harriman propounds the following theories regarding these four essentials:

Equilibrium.—Equilibrium is possible only during propelled flight or forward glide, and is now obtained and maintained by flexing of wing rear extremities or ailerons, in such a manner that the changed angle which the wing makes with the horizontal line of progress influences the wing, so that it will cause its side of the machine to move about the longitudinal axis, above or below, in opposition to the wing on the other side.

The principle of control is like that of balancing the bicycle or motorcycle, and the consequence of the cessation of forward propulsion is likewise the same with the aeroplane and the motorcycle, for when the forward action ceases, the controls lose their effectiveness.

The balancing of a flying machine, by alternate movements of flexing opposite wing extremities, has no precedent in nature, and is not of sufficient area or movement to counteract unusual disturbances. Its location is incorrect, and is operative only during forward progress. Such a control can not result in gaining a position of inherent stability in a machine of fixed horizontal wings.

Equilibrium, or the horizontal position of the present flying machine relies on forward flight and is manually maintained by constant attention and instinctive movements in immediate counteraction to any unusual disturbance that tends to throw the machine out of balance.

Automatic equilibrium, likewise, is possible during constant forward propulsion, but if the motor stops and forward motion ceases, manual or automatic wing-flexing movements have no more influence in maintaining horizontality than juggling the handle bars of a bicycle has in keeping it from falling over after its forward progress has ceased.

Stability.—Just so long as machines are built with fixed horizontal wings, there can be no condition of stability in propelled flight or in soaring descent. Until this fact is understood and heeded, no progress can be made in the solution of the problem of stability of mechanical flight. A means must thus be provided for changing the shape of the machine in a manner that will resolve it from a form suitable for equilibrium during propelled flight, to one having inherent stability during non-propelled descent.

Stability, broadly speaking, cannot be a condition incident to propelled flight, but it can be a condition incident to non-propelled descent.

Equilibrium and stability of flight must alternate and resolve from one to the other in proportion to the speed of forward progress, equilibrium being influenced by the horizontal force of propulsion, and stability by the vertical attraction of gravitation.

To make a flying machine with rigidly affixed horizontal wings respond safely to these two forces whose proportions vary as the speed of the machine, is an impossibility. This is the fundamental defect of the present

machines and the principal cause of their continual destruction, and of the lamentable deaths for which they are responsible.

Until designers, builders, and operators understand the difference between equilibrium and stability and the necessity for dealing with them as two distinct essentials of flight, acting at right angles to each other, no progress can be made in providing safety of the machine.

The conditions governing equilibrium do not by any means govern stability, and vice versa. Equilibrium necessitates a condition of equal balance of all weights, resistances, and forces, about the longitudinal axis during propelled flight. Stability necessitates conditions of an entirely different nature, a complete changing of weights and resistances, by placing the weights far below the wings in such a manner that all resistances, forces and weights equalize on the vertical axis.

Mr. Harriman most emphatically claims there can be no inherent stability during propelled flight; under that condition a machine is a projectile, and as such may twist upon any or all of its three axes, and it must then be kept in equilibrium by means of the shifting weights or shifting of counteracting and sustaining areas and flexing of planes.

Equilibrium applies to propelled flight; inherent stability applies to non-propelled descent. Equilibrium relies upon horizontal propulsion; inherent stability relies upon the perpendicular attraction of gravitation, acting upon the weights, in counteraction to the buoyant elements of its sustaining surface during descent.

The solution is, propulsion for equilibrium; non-propulsion for inherent stability.

The natural force of gravitation that tends to pull a flying machine downward during non-propelled descent should be utilized in maintaining a position of inherent stability in the same manner that the mechanical forces of propulsion, while pulling the machine forward, are utilized in maintaining a position of equilibrium.

As the speed decreases the horizontal forces of propelled flight and equilibrium should resolve into the vertical forces of non-propelled descension and inherent stability. To do this and still maintain the horizontality of the machine it is necessary to change the shape of the machine, by raising its supporting means, just as the bird's wings are raised in natural flight.

Natural Flight.—Were it not for nature's demonstration of flight man would never have had an inspiration for its accomplishment. The demonstration of natural flight, to all ages, has been as clear and comprehensive as was that of any other natural movement on land or in the water. As man has in these others already equalled and surpassed nature's accomplishments, so, by careful observation, man will accomplish and surpass the feats of nature's denizens of the air.

In so far as equilibrium, stability, control and adaptability apply to all of nature's creations, so to that extent may we adapt these qualities to mechanical flight.

During bird flight the wing wave movements extend above and below the body, the down stroke causing flight and the up stroke causing inherent stability; the body rising on the down stroke and lowering on the up stroke, follows a wave line of flight that approaches a straight line as the speed increases. Gravity and power work alternately in gaining and maintaining stability in descension and equilibrium in flight, the instinctive movements of the head and tail giving control and direction. When altitude is gained it is possible for a bird to soar downward through its sustaining medium, the air, and in so doing, it spreads its wings in horizontal equilibrium and drifts through space, guided by its head or tail, or by upraising its wings, it soars in the position of inherent stability to earth.

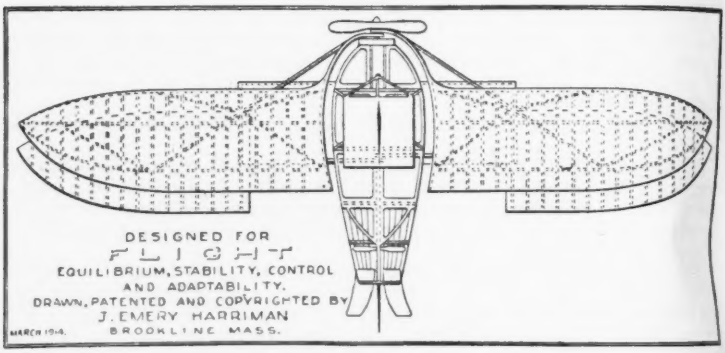
With nature's demonstration of flight in all its forms before us, as well as its demonstrations of equilibrium, stability, control, and adaptability in flight and descension, it is sufficient to inspire greater efforts in perfecting and promoting the flying machine. To study natural flight it is necessary

to observe but one action at a time, for the bird is so harmonious in all its movements that there is very little indication of the graceful and instantaneous changes of form and action which occur during flight to meet the conditions of equilibrium, stability, control, and adaptability.

The Problem.—The problem can be solved, and in the following manner: In the first place, economy should not be practiced to the sacrifice of efficient mechanisms; lightness should not be sought at the cost of strength and durability of material; untrained and cheap labor should not be substituted for experienced and efficient mechanics and operators; and simplicity should not be adopted to the elimination of necessities.

Propelled flight is a problem of equilibrium, while non-propelled descension is a problem of stability. Until the difference between these two is understood deaths and destruction will continue.

A flying machine, to be safe and efficient, must be a land and water machine, as it must start from either of these places and return to one or the other. As a landing cannot always be selective, safety demands provi-



HARRIMAN'S HYDROAEROCAR

Top View. Adjustable to Air, Land and Water Travel

sions for adaptability to both conditions. It must be a machine subject to propelled flight or drifting progress on sea, land, and in the air, and must be interchangeable in its form to meet these different requirements of control and adaptability.

Mr. Harriman's Design.—In designing the body or hull of a machine I would be governed by the projectile shape of the fish or bird, the framework to be entirely covered and to contain the operator, passenger, propelling power, equipment, and operating mechanisms.

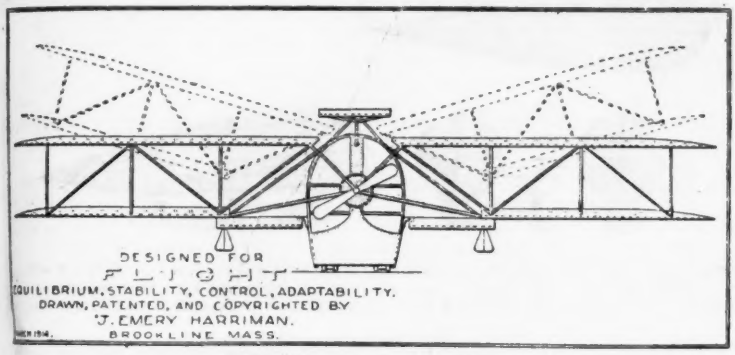
The shaft should pass entirely through the body on the central longitudinal line, and at an angle sufficient to hold a front air propeller out of the water, and a rear water propeller in the water.

The motor should be mounted directly on the shaft, and the operator's seat should be behind it, and in reach of all levers, subject to body, hand, and foot control, and with means for starting the motor from this position. The floor should be of pontoon construction of aerocurve shape, and contain pontoon wheels adapted to land travel. It should be made up of airtight compartments, the top of which becomes the floor of the car and of sufficient strength to receive the supports and braces of the motor, and of form to fit the side, front and body framework.

The wings should be designed and constructed on natural lines, tapering to wing tips, for purposes of maintaining stability during descension.

The wing braces should be rigid, diverging struts, firmly braced to each other and to the wing frames. The wing frames should be removably and operatively pivoted to the operating car in such a manner as to be held at any lateral dihedral angle, subject to manual, automatic, or mechanical control. The horizontal line passing from tip of the wing should be the median line of the wings.

The controlling mechanism should be an overhead, centrally located canopy or aeroplane, pivotedly and universally mounted and having an umbrella-like handle extending downward in front of the operator. To this handle should be attached all other necessary guiding planes or rudders, the control of which should be of an instinctive movement. This canopy, during forward propulsion of the machine, would control its direction, influencing the aeroplane upward or downward, or to the right or left in accordance with its angle of influence. It would be a lifting and sustaining plane, and would guide the machine in equilibrium during propulsion, when the wings are horizontal, as well as retard the downward movement and



HARRIMAN'S HYDROAEROCAR

Front View. Adjustable to Air, Land and Water Travel

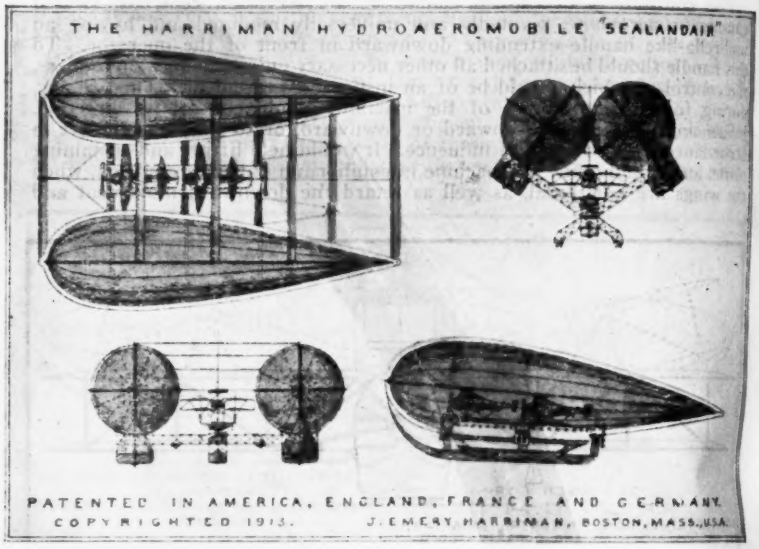
govern the direction during non-propelled descension, when the wings are upraised and the machine is in a position of inherent stability. The machine should be constructed so that when completely assembled it would be in perfect balance when suspended by the wing tips.

If part of the money that has been wasted in machines for speed, altitude, distance and duration had been applied to experiments for the slowest possible flying machine, adaptable to low and short flights, the problem of stability would have been proven long ago.

Dirigibles.—Mr. Harriman spoke briefly on the question of dirigibles, and showed a chart of his solution of lighter than air variety of air craft. He explained a pivoted parallel dirigible adaptable to land, air and water travel, and in Mr. Harriman's opinion it will be along such lines of construction that the first around-the-world machine will be built. Such a machine would be of the greatest importance in warfare, and it is safe to predict that the government will work along these lines for a solution of their ambitions.

Such a craft would cost a quarter of a million dollars, making it an expensive plaything even for our multi-millionaires, but it must come, provided the four essentials—stability, equilibrium, control and adaptability are to be properly considered.

The one great theory which Mr. Harriman propounded over and over again was, "There can be no inherent stability during propelled flight," and he had no difficulty in convincing his listeners that that theory is true. If he is correct, he has propounded a theory that is Newtonian in scope and one that must be listened to with the greatest respect.—*The Brookline Townsman.*


THE HARRIMAN HYDROAEROMOBILE "SEALANDAIR"
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THE GERMAN AIR TRAFFIC BILL.—The Reichstag recently took up a bill for regulating aircraft traffic. According to the *Engineer* the bill aims, in the first place, at minimizing accidents, and provides for this purpose that all new aeroplanes and airships are to be first tested on a flying ground. A second part of the measure deals with aerial navigation companies. As no such undertakings yet exist, great freedom is given to the Federal Council to issue regulations on this subject. Finally, the bill regulates by a number of complicated paragraphs, in which the provisions with regard to motor car traffic have for the most part been adopted, the liability for accidents caused by aircraft.—*Scientific American.*

GERMAN AVIATOR KILLED.—The German aviator Reichelt was killed to-day by a fall due to one of the wings of his aeroplane breaking during a flight.—*New York Times.*

During the year 1913 the Royal Aero Club granted 323 aviator certificates, of which 224 were granted to officers, petty officers, non-commissioned officers, and men of the navy, army, and imperial forces (172 to officers, and 52 to petty officers, non-commissioned officers and men).—*Army and Navy Gazette.*

LESSONS FOR AVIATORS.—Lessons taught by accidents to aviators formed the subject of discussion at a meeting of the Aeronautical Society over which Major General Ruck presided, at the Royal United Service Institution. Colonel Holden pointed out that accidents were either due to the

pilot or to faulty design or mechanical failure of some portion of the aircraft, and many of them could be guarded against more or less effectually, if not entirely prevented, by suitable precautions being taken. Want of sufficient knowledge or skill was obviously not the most frequent cause of fatal accidents, or more pupils and learners would have been killed than skilled pilots. Errors of judgment had, however, caused many. With regard to hazardous flying, no regulations could prevent it. In no fewer than six fatal accidents out of eighteen the use of a safety belt might conceivably have saved the pilot's life, and in more than one instance enabled him to regain control and avoid any accident at all. There could be no valid objection to the use of a safety helmet.—*The Engineer.*

AIR SCOUTING AT NIGHT.—Brigadier General F. G. Stone has the following notes in the April issue of the *Professional Journal* of the Royal Artillery:

Night scouting by aeroplane has not hitherto been attempted, and is not likely to be effectively carried out before 1915, but that it will be carried out in the immediate future cannot be doubted. . . . Lieut. Stoeffler's truly wonderful flight last year of 1376 miles across country, in less than 24 hours, involved performing one-third of the distance in the dark; it was a magnificent record in every way, and was doubtless a disagreeable surprise to the French war-office and to French aviators, who hitherto had held the record for long distance flying in one day with Brindejonc de Moulinais's flight of 869 miles in June, 1913, which included no night flying worth mentioning. Most of the prize flights in 1913 had to be competed for between sunrise and sunset, a very necessary limitation; but in Germany this restriction was withdrawn last year, and its withdrawal resulted in a good deal of night flying and also in many accidents. The present year will see many interesting night flying competitions, which will doubtless furnish useful data for regularizing night flying for military purposes. Hitherto, we have had some more or less sensational night flights, but none, so far as they are known, which can be regarded as practical from a military point of view; for instance, the flights of Lieut. Demanet, of the Belgian army, in a Farman biplane fitted with a bow searchlight of 50 candle-power, proved nothing except the fact that such illuminating power on a machine travelling at the minimum rate of which the Farman was capable, would not make a landing safe outside an aerodrome, or other marked-out and illuminated area specially selected for landing. . . . .

Apart from the necessity for knowing what one's enemy is doing during the hours of darkness, there is one very important point to remember about night scouting, as opposed to day scouting, and that is that the scout can come very much nearer to the ground without being seen.—*Naval and Military Record.*

CANALS

THE PANAMA CANAL.—The following interesting report on the Panama Canal was made by Captain Soares, master of the steamship *Harlesden* to the owners of that vessel, Messrs. J. and C. Harrison, London, a few weeks ago:

Through the courtesy of the Canal officials I have been able to get a good look at the Canal and gain some interesting and reliable data, which I am now sending you, portions of which you will no doubt find interesting. The Canal is expected to be sufficiently ready to allow of vessels passing through next July. The Colon end is now nearing completion and is considerably in advance of the Panama end. The total length is 50½ miles and the average depth 37 feet. The approximate time in passing through from one ocean to the other will be about 12 hours, three hours of which are taken up in passing through the locks. Forty miles of the Canal are considered to be of sufficient width to allow of vessels proceeding at full speed, there being 15 miles of sea level channel, seven on the Pacific and eight on the Atlantic side, and 35 miles of lake navigation, in all of which the minimum channel width is 500 feet, and the maximum 1000 feet. This leaves about nine miles of channel through the Culebra Cut, where the bottom is barely 300 feet, through which vessels must proceed at reduced speed. The remainder of the distance (1½ miles) is taken up by the locks.

There are six locks in the Canal—three at Gatun (Colon end)—the upper one being 85 feet above the Atlantic mean sea level, one at Pedro Miguel (Panama end) 30 feet above the level of the Miraflores Lake, and two at Miraflores, the upper one being 55 feet above the Pacific mean sea level. The locks are in pairs and allow of vessels locking through in opposite directions at the same time. The length of each lock is 1000 feet, width 110 feet, and depth of water on the sills, 40 feet. The method used in raising or lowering the water in the locks is novel. In order to do away with the usual surging and swirling of the water in the locks caused by side sluices a system has been adopted in the Panama Canal that reduces this disturbance to a minimum. The water is brought in or out of the locks through huge tunnels, 18 feet in diameter, passing lengthwise through the center and side walls of the locks; branching out from these tunnels at right angles are smaller tunnels, which run out under the lock and communicate with circular openings in each lock floor, each about two feet in diameter. The average rate of raising or lowering the water is about two feet per minute. This system, according to report, seems to work very satisfactorily.

Another most interesting device is the electric locomotive intended for towing purposes through the locks, all steamers being rigidly prohibited from using their own power while in the locks. At the ends of the locks extensions are built out in the form of concrete piers faced with two heavy fore and aft wooden fenders, and all vessels will be compelled to bring up alongside these wharves before entering the locks in order to connect up with the locomotives which are to be stationed on the side walls of the locks and equipped with heavy towing wire hawsers. Each vessel passing through will have four locomotives in attendance: one on each bow for towing, and two aft, one on each quarter to retard the progress if necessary and keep steamer in position. The locomotives run on tracks and a center cog rail close to the edge of the lock, and while working on the cog rail travel about two miles an hour. When they have completed a tow they switch over to a track further back from the edge, and where the cog rail is omitted, so are enabled to return at a greater speed. Theoretically the idea works all right, but the practicability of it remains yet to be proved.

To reduce the possibility of accident to the lock gates protective chains guard gates and lower guard gates are provided, and should all these devices fail, emergency dams have been constructed and are always ready for instant use. Two are installed at the upper end of each set of locks and re-

semble a swing bridge, and when put into use are swung out across the lock and from their lower side a set of openwork wickets or girders are lowered, which fit into a grooved sill on the lock floor. When these girders are down and in place small iron plates are run down in grooves and gradually build up a dam as one plate joins another. Another interesting feature is the lock gates, which vary in height from 47 to 82 feet, and weigh from 300 to 700 tons each half-gate. These half-gates are opened and closed by a small engine of 35 horse-power. The main power is, of course, in the gearing.

The Gatun Dam (Colon end) is a huge piece of work, and is more of a mountain than a dam. Its construction made possible the Gatun Lake (85 feet above mean sea level), from which the working power of the whole plant is obtained. About midway across the dam is constructed a large hydro-electric plant, which uses the water from the lake, passing it through turbines, thereby generating all the power necessary to work the lock machinery throughout the entire length of the Canal. As an extra precaution, however, there is a 6000 horse-power plant at Miraflores, which is an oil-burning steam plant, and is an auxiliary to the Gatun plant should it ever be needed.

During the course of excavation the Culebra Cut has given much trouble, 19 slides in varying sizes having occurred from time to time. A large one happened some little time back, almost filling up the Canal at that particular part. From what I understand there appear to be two kinds of slides: one is termed a true slide, a large mass of soil sliding from a hard rock surface in glacial action toward the cut, and no means have been found of overcoming this character of slide other than by clearing it out as it slides in, and to do so until the sliding soil reaches an angle flat enough to stand. The other kind of slide is caused by the great weight of soil on the banks of the cut weighing down and squeezing out the soft underlying strata, which oozes out on to the bed of the cut and allows the bank to settle. The bank in settling breaks loose from the land farther back and then acquires a lateral movement toward the cut. To prevent further slides of this kind hundreds of laborers and a large amount of machinery are at present employed removing rock and soil from the tops of the banks in order to reduce the weight and prevent further slides. This is the narrowest part of the Canal (300 feet), and I have little doubt will be the chief trouble to the Canal officials for some time to come.

The general idea that the Pacific Ocean is higher than the Atlantic is erroneous. From information I find that the mean sea level is exactly the same in both the Atlantic and the Pacific; the difference is all in the tides. The average tide on the Pacific side is 20 feet, while the tide on the Atlantic side is only 26 inches. The exceedingly high tide on the Pacific side is supposed to be due to peculiarities in the formation of the Gulf of Panama, into which the Mexican and South Pacific currents flow.—*Shipping Illustrated.*

Navigation of the Panama Canal will have to be regularly suspended during the early morning hours or else stringent regulations must be enforced to insure safety, on account of fogs in the Culebra Cut, according to Captain Hugh Rodman, U. S. N., who is to become superintendent of operation. It has been found that from midnight until seven or eight o'clock every morning heavy mists and fogs hang in the cut, which even without the menace of fog will be one of the most difficult parts of the canal for the pilots. Canal operation will start with not more than eight pilots on the payroll. There seems to have been a general belief that 60 or more pilots would be engaged.—*Shipping Illustrated.*

A prominent German engineer expresses doubt as to whether under the present system the Panama Canal can ever be supplied with sufficient water to make possible the passage through it of warships and big liners. Gatun

Lake, he says, will be able only for part of each year to feed the canal to a depth of 30 feet, and he predicts that during the dry season it will fall to 18 feet, and even lower. Moreover, he warns everybody against having too optimistic views respecting the changes in routes for the world's trade, as a result of the waterway.—*Shipping Illustrated.*

All vessels entering the Panama Canal will have a pilot who will take the ship to an anchorage from which she may not move without permission from the proper authorities. As soon as the quarantine officer releases a ship, each of the other canal officials will go on board and as soon as the vessel moves toward the canal all her wireless and other signalling arrangements will be under the immediate control of the canal authorities. The engines of a ship will also be turned over to the canal authorities the moment she ties up to the approach wall of the canal locks. The engines will be locked by the canal officials and a constant watch will be kept on them by a canal guard and an engineer of the ship until after leaving the locks. Pilots are already being trained for this purpose.—*Shipping Illustrated.*

WHAT PANAMA SLIDES HAVE COST.—We have measured the cost of the Panama Canal in dollars and cents, and in an article in the *National Geographic Magazine* for February Mr. William Joseph Showalter gives us a hint of what it represents in the expenditure of human brains, nerve force and vital energy. It cost Colonel Gaillard his health and his life, and it has practically added twenty years to the age of Colonel Goethals during the six years in which he has struggled with its most perplexing problem, that of the land slides.

"Over 250 acres of ground lying outside of the intended banks of the canal, and containing over thirty million cubic yards of material, have," Mr. Showalter tells us, "swept, with silent but terrific force, down into the canal. Now this onslaught has demoralized an entire railroad system; now it has put the compressed air and water systems out of commission; now it has bottled up one end of Culebra Cut with an avalanche of debris; now it has imprisoned dirt trains and wrecked steam shovels. But with all the wreck and ruin and chaos there have been men with wills of iron who have met each new situation with a new spirit of determination; men who have never permitted any catastrophe to turn them aside from their ultimate purpose; men whose achievements in the face of unprecedented difficulties make a story as inspiring as anything in human history.

"Consider what the removal of thirty million cubic yards of material means. It is enough to build a sort of Chinese wall 7 feet thick and 7 feet high reaching from New York to San Francisco. It is more than could be drawn by all the horses and mules in the United States. It would fill a million and a half big Lidgerwood cars, enough to make a string 12,000 miles long. It is a wonder, the greatest engineering wonder of the age, that they have been able to remove 106 million cubic yards of material from the cut in less time than it was estimated that they could remove 53 million cubic yards. And this wonder grows when I look at their cost sheets and see them removing a cubic yard for an average of sixty-odd cents when it was estimated that, unhindered by slides, the cost of removing a cubic yard would be 98 cents.

"As I spoke with Colonel Goethals on the subject," Mr. Showalter says, "I saw the tears well up in the eyes of that man of iron, and I understood what those slides were costing him. I knew then whence had gone that buoyancy of youth which I had met in 1908, and that enthusiasm of purpose which I had seen in 1910. Now instead there was the grim determination of a veteran of a thousand conflicts, who would fight on to the end only because Duty's voice ever spoke louder in his ear than Pleasure's.

"It is certainly reasonable to suppose that all the delays the slides imposed held up the work by eight months, so that but for them we might have seen a cut through Culebra Mountain, with a bottom width of 300 feet, completed

by January 1, 1912, in five years; whereas the most conservative estimate had set down eight and a half years to make a cut with a bottom width of 200 feet. As a matter of fact, the amount of material that was contained in the cut as originally planned, 53,800,000 cubic yards, was removed before the end of the calendar year 1910, or in less than four years.

"One of the wonderful things about the building of the canal was how, in the face of all the unforeseen difficulties that the slide problem involved, Colonel Goethals and Colonel Gaillard were able to drive down unit cost as the mercury in the difficulty thermometer sped upward. In 1908 it was estimated that the cost of removing a yard of soil would be around 98 cents for the whole cut.

"For the fiscal year 1909 they hammered this cost down to 78⅔ cents; the next year they lowered it to 73⅝ cents; in 1911, although the slide problem became much more acute, they forced it still lower—to 63⅜ cents.

"But they were not satisfied even then; 1912 saw the slides more troublesome than ever, and in spite of this they forced the unit cost down to 54⅜ cents. Than this, there is no prouder showing in the history of business economy or of engineering."—*Army and Navy Journal.*

THE LIGHTING OF THE PANAMA CANAL.—The completed Panama Canal has been called a new wonder of the world.

It is more than that. It is a combination of wonders united in one vast whole.

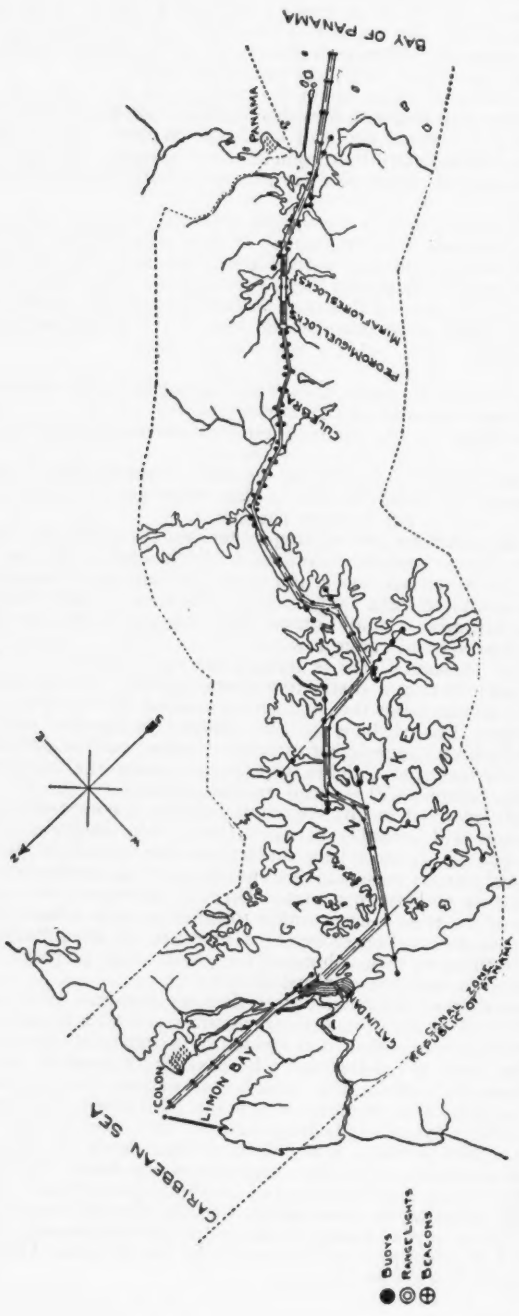
Not least among these wonders is the system of lighting which has been installed throughout the entire length of that waterway to enable vessels to utilize night as well as day in their passage.

The contract for installing the lighting system on the canal was awarded to the American Gasaccumulator Company of Philadelphia. By the terms of the contract the American Gasaccumulator Company were bound to install fifty-seven complete light buoys of the shape, size, and dimensions specified by the Isthmian Canal Commission, together with installations in some of the beacons and range towers.

Accordingly the Panama Canal is lighted throughout by automatic unattended lights each having a distinctive characteristic. At the entrances and through the Gatun Lake the channel is marked by a double row of automatic acetylene lighted buoys. The channel is further defined by powerful rapid flashing range lights one set at either end of each successive tangent. Through the Culebra Cut, or wherever the proximity of the banks permits beacons will be used instead of buoys.

As the principle involved in this system of lighting is comparatively new, a short description will probably be of interest. The illuminant used is dissolved acetylene: *i. e.*, acetylene under pressure dissolved in a tank filled with a special porous mass and acetone; acetone has a solvent capacity of 25 times its own volume per atmosphere of pressure; the acetylene storing capacity of the tank is accordingly 10 times its own volume for each atmosphere of pressure. Therefore, at a pressure of 10 atmospheres a tank contains 100 times its own volume of acetylene. Two or more of these tanks are attached to each buoy or installation.

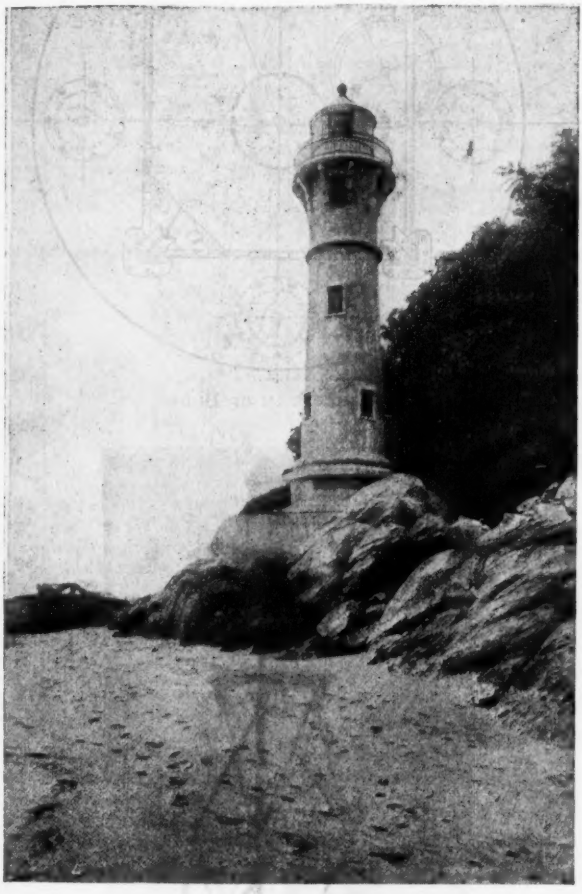
The gas released from the tanks passes through a governor or reducing chamber and from there into the flashing chamber and then passes through a pipe to the main burner where it is ignited by a constantly burning pilot flame. The pilot flame is fed through a by-pass direct from the governor. The system shows an entirely new principle in flashes which permits the production of a very large number of separate and distinct flashes compared with the older types of flashing lights. This new flasher may be adjusted to give light periods of any desired time, down to one-tenth of a second or less, alternating with dark intervals of any desired length. The principles of the system used are covered by the Dalén patents, which are owned, in North America, its possessions, Canada, Central America, Cuba and the West Indies, by the American Gasaccumulator Company of Philadelphia, Pa., and in other parts of the world, by the Svenska Aktiebolaget Gasaccumulator of Stockholm, Sweden.



PANAMA CANAL

SHOWING LOCATION OF LIGHTS

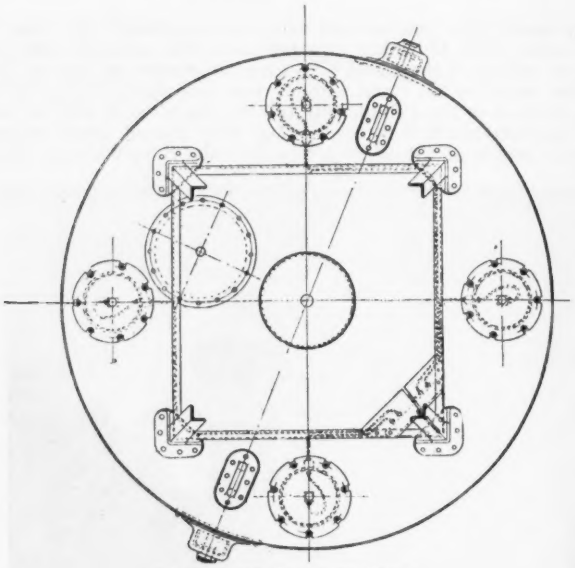
The cut represents a beacon with acetylene installation in Range No. 11 Panama Canal, while the other cuts represent the acetylene buoy used in marking the course of the canal. To give the reader an idea of the buoy used on the course of the canal, an elevation and plan of a typical buoy is given in which *A* is the cylindrical body or chamber, 8 feet in diameter, made of five-sixteenths inch steel plate with dished heads riveted on. Through the center of the body passes the tube *B* to which is bolted the



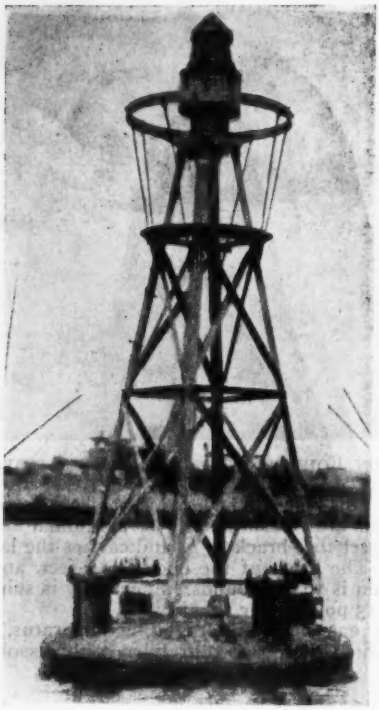
BEACON EQUIPPED WITH AGA LIGHT APPARATUS

counterweight *C*. This tube is made in two pieces as indicated at *D*, for convenience in ocean transportation. The pyramidal skeleton tower *E* is bolted to the cast steel foot brackets *F*, and carries the lantern *G* at a focal height of 15 feet. The draft of the buoy is 12 feet, and the total weight without anchor chain is 10,500 pounds. Each buoy is subjected to an initial hydrostatic test of 15 pounds per square inch.

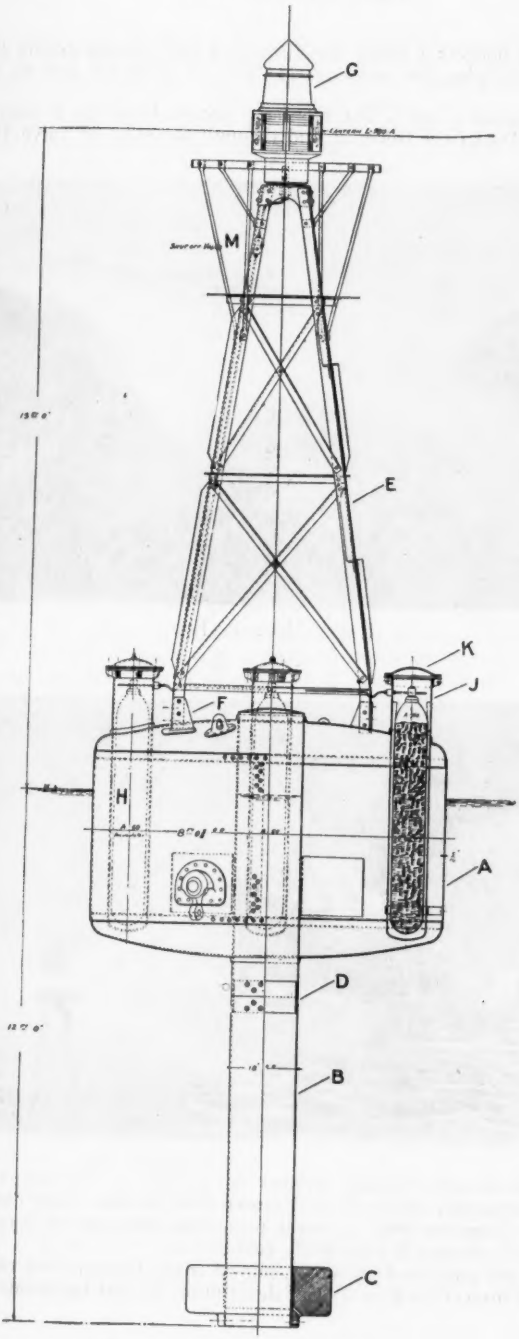
Referring to the gas supply and lighting apparatus, *H* represents the accumulators of which there are four filled with dissolved acetylene and



LIGHTING PLAN OF BUOY



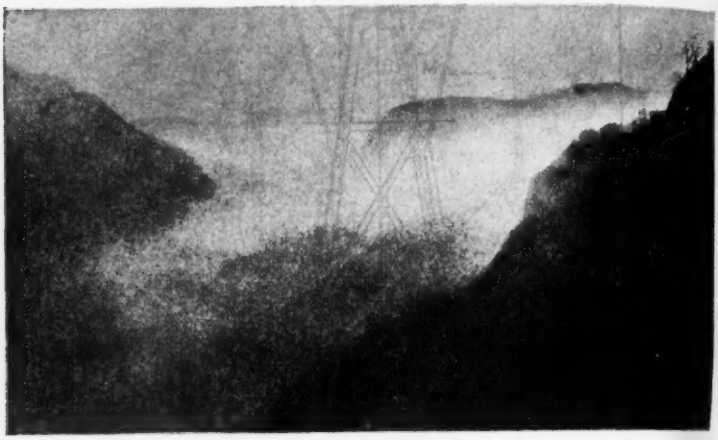
A CANAL BUOY



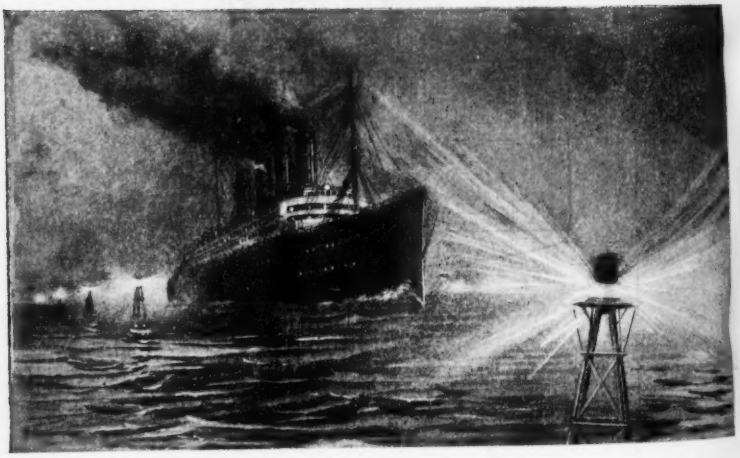
LIGHTING ELEVATION OF BUOY

inserted in the pockets *J* which are furnished with hinged covers *K*. *G* is the lantern containing the pressure regulator or governor and the flashing mechanism.

The high pressure gas is led from the accumulators to a manifold *L*, thence up the leg of the tower *E* and through the shut-off valve *M* to the



EARLY MORNING FOG



governor which automatically reduces the pressure. The gaspiping is of special manufacture, made of solid drawn steel, 8 mm. outer diameter, by 4 mm. inner diameter with an outer protection envelope of copper drawn therein, which renders it completely rust-proof.

Although not employed on buoys, but on many beacons and range lights it may be of interest to give a brief description of that ingenious invention

of Mr. Dalén, the sunvalve. The sunvalve controls the flow of gas to the burner so that the light will burn only in darkness. It is actuated entirely by light; its construction and operation being based on the well known physical law, that a body with a light absorbing surface attains a higher temperature and consequently expands more than a similar body with a light reflecting surface when both are exposed to the same light. A central copper rod coated with lamp black to give it the property of absorbing light to the greatest possible degree is surrounded by three copper rods that have surfaces of polished gold which causes them to reflect light to the greatest possible degree. The lower end of the central rod bears on a valve controlling the flow of gas. When light is withdrawn from the apparatus this central rod contracts, the valve is opened and allows the gas to flow to the burner; but when light falls upon the apparatus it is absorbed by the blackened central rod and transformed into heat which causes the rod to expand forcing the valve lever down on the valve seat thus shutting off the flow of gas to the burner. This automatic light keeper effects great fuel economy and increases the service capacity of the acetylene tanks.

The above description of the method of lighting the canal is a brief synopsis of a pamphlet, containing an address made by Mr. James Pattison before the Society of Naval Architects and Marine Engineers in New York.—*The Navy.*

MISCELLANEOUS

THE SUBMERSIBLE BATTLESHIP.—A good deal of matter is being written over what is alleged to be a new discovery to the effect that affairs are trending in the direction of the production of a submersible battleship. It is about five years since it was announced—unofficially, of course—that the Admiralty had plans for such a vessel in their possession, and since then it has been stated that designs upon similar lines have been prepared by the late Gen. Cuniberti, Signor Lorenzo d'Adda, and Mr. Hudson Maxim. There is thus nothing novel in the idea, though it would flutter the dovecotes of Europe if any great power were to lay down such a vessel. The idea seems to be that a battleship carrying two heavy-gun turrets on a turtle-back deck, and capable of submerging itself until nothing except the turrets, conning tower, and smoke stacks (if any) showed above the water-line, would have a greater chance of escaping aerial attack than the typical battleship of to-day. From one point of view this is correct enough, because, other things being equal, the smaller the target the less chance there is of its being hit. On the other hand, the more the size of a ship is reduced the less is its chance of hitting, since its offensive power must necessarily diminish with its displacement. In other words, the big ship has a better chance of destroying its aerial enemies, and that, after all, is a better way out of the difficulty than escaping from them. The submarine is in a different category, since the big ship and the small are equally helpless against it; though even here the big ship has an advantage, since an explosion that would sink a ship of 10,000 tons, might not affect a 20,000-ton ship more seriously than to give it a list of a few degrees. It has also to be remembered not only that the effectiveness of guns depends largely upon their freeboard above the water-line, but also that the deeper a ship is in the water the more liable is she to successful torpedo attack.—*Naval and Military Record.*

WHITE STAR LEVIATHAN.—The dimensions of the new White Star leviathan *Britannic*, launched at Belfast February 26, are: Length over all about 900 feet, breadth, extreme, about 94 feet, depth, moulded 64 feet 3 inches, total height from keel to navigating bridge 104 feet 6 inches, gross tonnage about 50,000 tons, load draft 34 feet 7 inches, displace-

ment at load draft over 53,000 tons, I. H. P. of reciprocating engines 32,000, S. H. P. of turbine 18,000, passenger accommodation over 2500, crew accommodation 950. There are eight steel decks amidships—boat, promenade, bridge, shelter, saloon, upper, middle and lower—while at the ends there is the orlop deck, making nine decks in all. The launching weight of the *Britannic* was 24,800 tons. The time taken by the launch was 81 seconds. The total load on the trigger was 560 tons. No hydraulic starting jacks were needed.—*Shipping Illustrated.*

REVENUE CUTTER WORK IN NORTHERN WATERS.—Arrangements for the annual patrol of Behring Sea and adjacent waters in the far north have been completed. The revenue cutter *Bear* will during the summer make a cruise to Point Barrow, the most northerly point of Alaska. The *Unalga* will leave direct for Unimak Pass, where she will be ready to render assistance to the first passenger liners steaming into Behring Sea and will follow the merchant men into Unimak Pass. The cutter *Tahoma* will leave Seattle May 1.—*Shipping Illustrated.*

COMPLETION OF THE TANGANYIKA RAILROAD.—It was officially announced from Berlin on February 2 that the railroad across German East Africa from Dar-es-Salam to Lake Tanganyika was completed February 1 when the rails were laid down at the western terminus, Kigoma, a few miles north of Ujiji. The railroad is 777 miles long and is likely to have important influence not only upon the development of the German colony but also upon the economic future of the Belgian Congo and of Central Africa generally. Express trains will now be able to reach the coast from the lake in two days as compared with the 42 days' journey of the caravans. An important proportion of the Central African trade is bound to gravitate to Dar-es-Salam.—*Geographical Record.*

AFTERMATH OF THE BALKAN WAR.—At a session of the American Academy of Political Science Major Louis L. Seaman, U. S. V., presented an interesting paper on the "Aftermath of the Balkan War," Dr. Seaman tells us that "friction had arisen among the allies over the division of the domain from which the Turk had been driven—over the spoils of war. This might easily have been settled by the powers, had they so determined, but they remained passive until reconciliations became impossible, and suddenly, almost without premeditation, the allies were plunged into a second war, more bitter and bloody than that from which they had just emerged. Like pawns upon a chess board the combatants were played, until the shadow of death rested upon almost every household in the land, when not only the flower of the armies, but the young and old and almost decrepit—even the prisons were emptied, and their inmates, many of whom he saw unshackled and sent to the firing line as cannon fodder, were slaughtered like swine in the shambles.

"Then, too, it was that pestilence played its deadly rôle. Careful preparation in the form of medical and surgical equipment had been made for the troops in the war with Turkey, and notwithstanding the terrible battle casualties and long, difficult marches through mountainous territory and the privations incident to a winter campaign in high altitudes, the armies of the allies, especially the Bulgarians, who bore the brunt of the fighting, maintained comparatively good health. But the second war, the internecine conflict, burst most unexpectedly and with terrible severity. In this sudden emergency medical and sanitary preparations had been overlooked. Among the Turkish troops impressed from Asia were stray cases of cholera, and the infection was carried to Adrianople, where it rapidly and materially reduced the power of resistance of the army of occupation. And when the victorious Bulgarians found themselves within the city, with its polluted water supply, the same scourge and other preventable diseases appeared—

enemies which history has shown cause a mortality of from five to twenty times greater than the combined engines of destruction. Pestilence spread with terrible rapidity. Detachments of Bulgarian troops centered in Adrianople had been sent to meet the Greek, the Servian, the Albanian and the Montenegrin, all of whom had combined against her, and with them went the germs of infectious disease, where in many cases it spread like a prairie fire. In a single deserted Bulgarian camp over a thousand unburied victims of this disease were found.

"The total mortality of the various armies in their successive campaigns, due to battle casualties, cholera and other preventable diseases, will never be accurately recorded. It is estimated at nearly 400,000, or more than double that of the Japanese and Russians in the Manchurian wars; while the human wreckage and financial loss are sufficient to cripple the contestants for a generation. All this terrible human suffering and wreckage, the massacres and atrocities and cruelties and financial loss could have been prevented by the great powers had they so desired or determined, just as easily as at a later date they dictated the creation of Albania as an autonomous state, or that Scutari must be ceded by Montenegro to Albania. In view of these facts who can challenge the evidence that the powers did not surreptitiously countenance the events which almost threatened the extermination of the participants, and so crippled their resources that years must elapse before they can again make themselves a factor in the politics of Europe?

"Well may the Macedonian cry, 'a curse on both your houses,' for those of her people who escaped massacre or death in other form are left with broken hearts and aspirations shattered, while their country is destined to be the hotbed or theater of the next scene of the tragedy. Greece and Servia have each nearly doubled their territory—their additions being respectively 87 per cent and 80 per cent, not one inch of which increase would they have secured but for the brilliant Bulgarian victories. Montenegro gained 67 per cent. Albania is created, and given autonomy and 10,900 square miles; Roumania, by bluff and blackmail, without the loss of a single soldier's life, is awarded 3600 square miles at the expense of Bulgaria—while the latter increases her holdings only 16 per cent, notwithstanding she contributed more to victory than the combined forces of all the others. More than 50,000 of the flower of her army are dead; as many more are left lifelong cripples; her finances wrecked, and her cup of bitterness is left overflowing with hatred and jealousy. Such are the fortunes of war, in which the grand total of lives sacrificed amounted approximately to 400,000 and the money loss was $1,400,000,000.

"The Balkan people are strong and vigorous, accustomed to the hardships of war, and they withstand the shock of injury with remarkable fortitude and courage. Many of the wounded suffered terribly from extensive lacerations, from shrapnel at short range, and owing to the lack of attention given at the front, where surgeons were scarce and surgical dressings still scarcer, their condition on reaching Belgrade in midsummer heat can better be imagined than described. Nearly all the wounds were septic—often gangrenous. Red Cross units from Germany, Russia, Austria and France and other countries were being rushed to the front, but the lack of surgical equipment and first aid dressings made conditions most deplorable.

"That many horrible atrocities and mutilations were committed in the Bulgarian campaign I know to be true. But this form of brutality was not confined to the work of one nation, and I believe all were tarred with the same brush. In the Red Cross hospitals, however, the Bulgar and Serb and Turk were treated side by side with equal humanity.

"Place not your trust in princes or visionary politicians, who play diplomacy or politics to gratify their personal ambitions, regardless of precedents, promises or justice. Witness to-day the attitude of our executive in refusing recognition to a sister republic, thereby threatening to embroil our country in a brutal guerrilla war, and to produce in Mexico a condition comparable to that of the Balkans."—*Army and Navy Journal.*

THE NEXT WAR IN THE EAST.—From the financial point of view, Turkey has emerged from the recent struggle in better shape than the other combatants, and her credit in the money market stands high. Servia and Bulgaria are crippled for some years to come, but the vast resources of the Turkish Empire have hardly been tapped. It is, therefore, not surprising that the Turks are openly proclaiming their intention not to rest satisfied with the present coloring of the map, and are going to start again, at no distant date, to recover their possessions in the Ægean and on the mainland from Greece. The new Minister of War, Enver Pasha, is the leader of the Young Turk revolution of 1910; he is only thirty-one years of age, and, as he says, he has not taken office to sit still. As a beginning, he has entered into a contract with Armstrong & Vickers for the reorganization of the navy, and has handed over the arsenal and docks on the Golden Horn to them. He favors a Germanophile policy, and expects the support of German influence in a war with Greece. The Greeks, on the other hand, know perfectly well what to expect, and are straining every nerve to increase their forces by land and sea. As long ago as last August they placed large orders for guns with Messrs. Schneider of Crensôt, and they are increasing their army to 400,000 men. While Turkey has bought the Brazilian dreadnought *Rio de Janeiro* from Armstrong, Greece has bought the Chilean dreadnought *Latorre* from the same firm. Altogether there is a prospect of important happenings in the Eastern end of the Mediterranean before another year has elapsed.—*Army and Navy Gazette.*

THE REVOLT IN EPIRUS.—The powers are considering the question of guarantees for the Epirotes in Albania. Although the government of the new King has succeeded in mastering the disturbances in Epirus at Koritza and Kolonia, the towns of Santi Quaranta and Delvino were in full revolt recently. At Santi Quaranta about 700 men, who were joined by 500 others from the neighborhood, declared for the autonomy of Epirus. They occupied a good position at Yasta. Delvino was held by 1500 Epirotes (we prefer not to style "rebels" those who are simply fighting for their own independence after their ancient form of government has been destroyed), and 2500 others were arming to their assistance from outside. The troops in garrison refuse to fire on the Epirotes. The Provisional Government not only counts on the neutrality of the Greek troops, but thinks that many natives of the territory, now included in Albania, will desert in order to help their brethren in their fight for freedom. The Greek army of occupation is 6000 strong, whilst the gendarmerie at the disposal of the King's government number only 2000. If the troops desert, the difficulties of stamping out the movement in favor of independence must be greatly increased. Despite the declaration by the King and the government against emigration, many Epirotes have left Koritza for Saloneka.—*Army and Navy Gazette.*

THE CHINESE REVOLUTION OF 1913.—The 1913 revolution was different in origin to its more formidable predecessor of 1911-12. The latter involved a large portion of the nation, and especially the well-to-do and intelligent classes of the south. The former was due rather to the ambitions of industrial provinces in Central and Southern China to increase their measure of independence. It was really a fight for power between the newly appointed government and the revolutionary party, or Kuomintang, a struggle to which the arbitrary conclusion of the Five-Power loan by the President added intensified bitterness. It was in no sense a contest between north and south; for the well-to-do classes withdrew from it after the first government success. The revolutionary party is supposed to have received support from Japan, which had long been connected by many ties with Southern China. The revolutionary party had its head-quarters at Nanking and disposed of some 80,000 badly-equipped and undisciplined men. These bands were, as a rule, defeated by very inferior numbers, and, as their initial dispersion was great and the revolution broke out prematurely, the

government forces accounted for them without great difficulty. What the troops could not achieve was accomplished by the "Kolonne goldbeladener Esel," provided by Yuan-Shi-Kai out of an advance by the Five-Power group. The revolution ended with the fall of Nanking, most of the leaders having previously fled to Japan, where Yuan-Shai-Kai did not deign to take further notice of them. He owes his success to his army, and is now endeavoring to free it from the influence of the provincial governments to which it has hitherto been in great measure subordinate. The revolution has proved that the last 13 years of reform have been insufficient to create a military spirit, and that it will be many a long day before the Chinese Army can become an important factor in the policy of the Far East.—*Journal of the Royal Artillery.*

BOMBARDMENT OF ESMERALDAS.—In the course of the insurrection headed by Colonel Concha, the port of Esmeraldas, to the north of Ecuador, has been bombarded. It appears that since December, Esmeraldas had been in the hands of the rebels under Colonel Concha, but on February 10, the government gunboats bombarded the city from the sea, while the military forces attacked it on land, and according to the reports the place was recaptured by the government. The navy of Ecuador consists only of the light cruiser, *Ministro Zenteno*, of 3600 tons, armed with eight 6-inch and ten 6-pounder guns, and five smaller vessels of very limited fighting value.

THE ALBANIAN KINGDOM.—The difficulties of the new king of Albania have begun in earnest. The southern part of his kingdom, known as Epirus since the days of Themistocles, of which the population is Greek, declines to recognize the new government or kingdom created by the powers. Epirus demands, as she always has demanded since the idea of autonomy for Albania was mooted, to form part of the kingdom of Greece. Union with Greece has been for a century the cherished desire of Epirus. The great powers would not listen, so the Espirotes have formed their own army, and have driven the gendarmerie out of the Epirote city of Koritza. At Argyrocastro, the Epirotes have inflicted a severe defeat on the royal troops. A council of ministers has assembled at Durazzo. The king proposes to lead his troops, and to obtain help from Austria-Hungary and Italy.—*Army and Navy Gazette.*

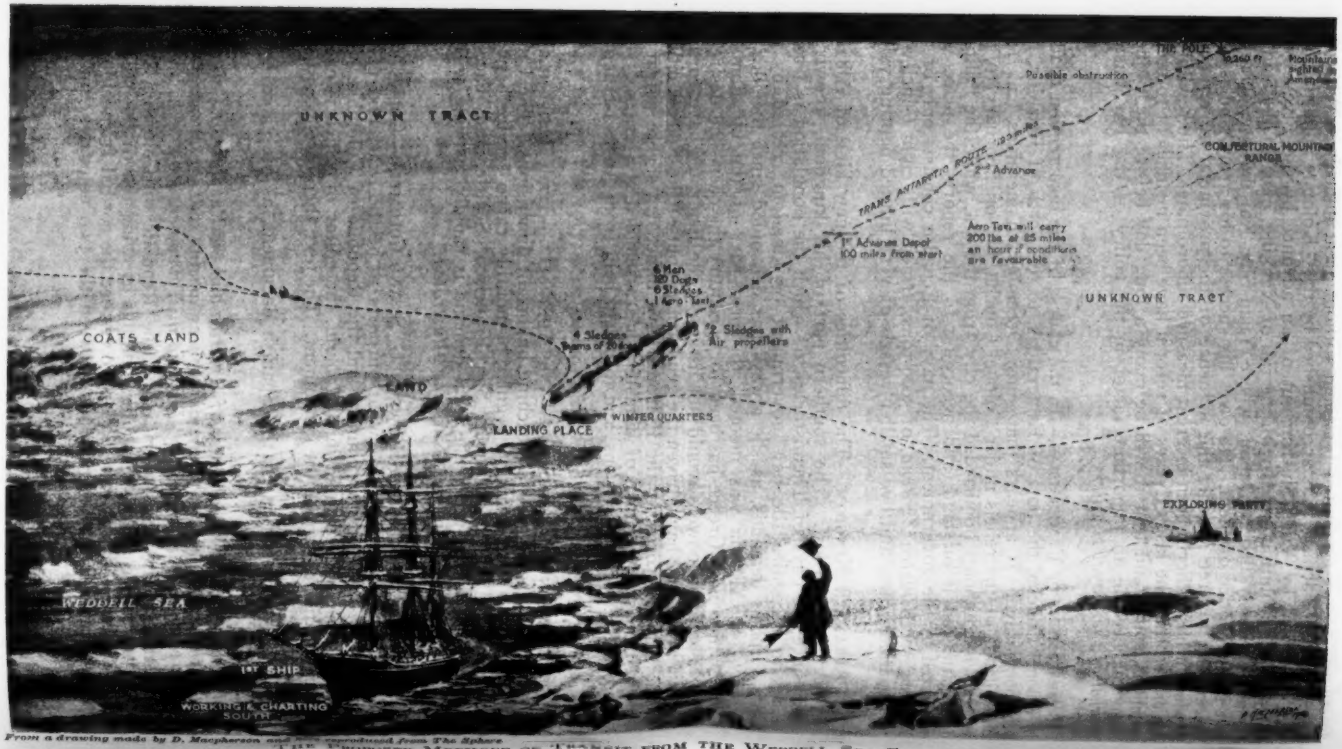
TRADE BETWEEN UNITED STATES AND AUSTRALIA.—Trade between Australia and the Pacific coast is reaching important dimensions. The Union Steamship Co. is establishing a regular bi-monthly cargo service between Australian ports and Vancouver, San Francisco, Seattle, and Tacoma. Primary products for which the local demand is rapidly growing will be the chief Australian exports.—*Shipping Illustrated.*

PROVISIONS OF THE TREATY BETWEEN U. S. AND COLOMBIA.—Copies have been received in New York of what purports to be the exact text of the pending treaty between this country and the Republic of Colombia. The matter was originally printed in *El Liberal,* the editor of which is one of the plenipotentiaries signing the instrument. The text, therefore, is assumed to be accurate.

The English translation of the Spanish document, as presented by *El Liberal,* is as follows:

Treaty between the United States of America and the Republic of Colombia for the settlement of their differences arising out of events which took place on the Isthmus of Panama in November, 1903.

The United States of America and the Republic of Colombia, being desirous to remove all the misunderstandings growing out of the political events in Panama in November, 1903; to restore the cordial friendship that formerly characterized the relations between the two countries, and also



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THE PROPOSED METHODS OF TRANSIT FROM THE WEDDELL SEA BASE TO THE POLE

From a drawing made by D. Macpherson and here reproduced from The Sphere

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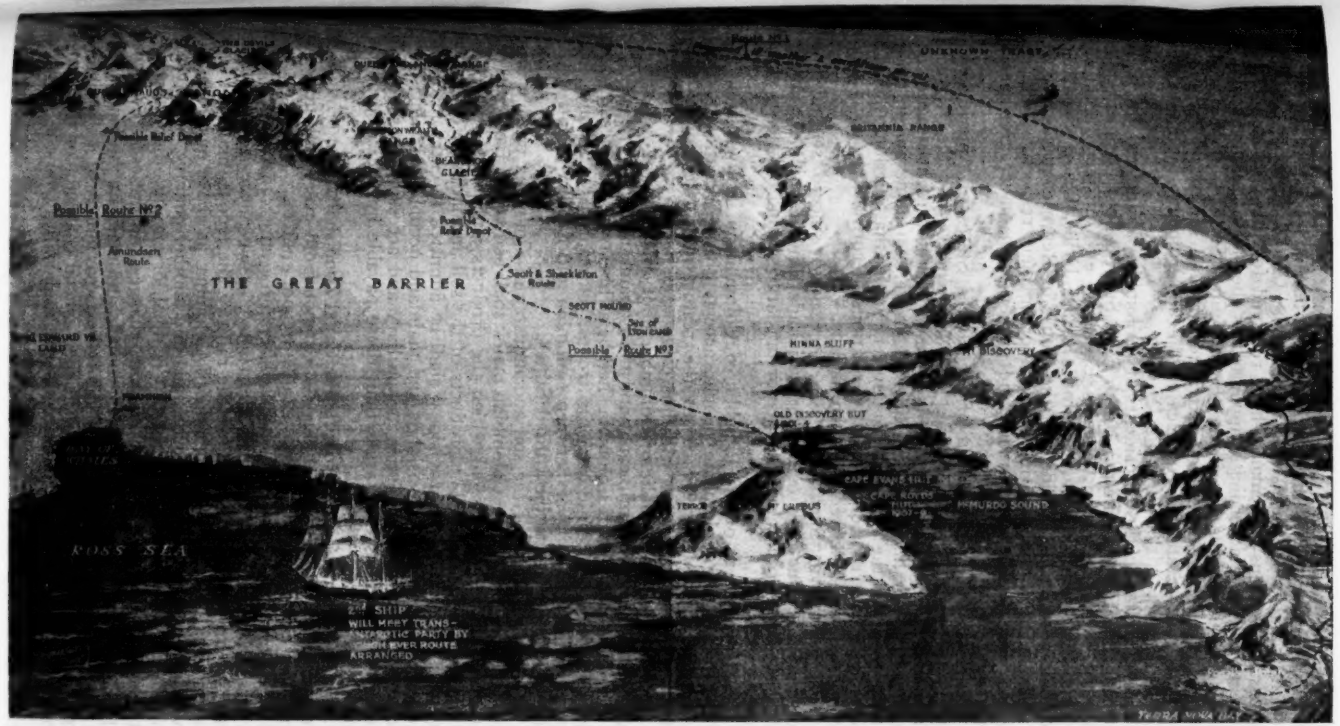

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DIAGRAMMATIC SHOWING THE SECOND HALF OF THE TRANSCONTINENTAL JOURNEY AND THE MANNER IN WHICH THE SECOND PARTY WILL ENDEAVOR TO HELP THE FIRST

to define and regulate their rights and interests in respect of the interoceanic canal which the Government of the United States is constructing across the Isthmus of Panama, have resolved for this purpose to conclude a treaty and have accordingly appointed as the plenipotentiaries:

His Excellency the President of the United States of America, Thaddeus Austin Thomson, Envoy Extraordinary and Minister Plenipotentiary of the United States of America to the Government of the Republic of Colombia, and

His Excellency the President of Colombia, Francisco Jos Urrutia, Minister for Foregn Affairs; Marco Fidel Suarez, First Designate to exercise the executive power; Nicolas Esguerra, ex-Minister of State; Jose Maria Gonzalez Valencia, Senator; Rafael Uribe Uribe, Senator, and Antonio Jose Uribe, President of the House of Representatives;

Who, after communicating to each other their respective full powers, which were found to be in due and proper form, have agreed upon the following:

Article I. The Government of the United States of America, wishing to put at rest all controversies and differences with the Republic of Colombia arising out of the events from which the present situation on the Isthmus of Panama resulted, expresses, in its own name and in the name of the people of the United States, sincere regret that anything should have occurred to interrupt or to mar the relations of cordial friendship that had so long subsisted between the two nations.

[The phrase in Spanish is: " . . . expresa sincero sentimiento por cualquier cosa que haya ocurrido, ocasionada a interrumpir o a alterar las relaciones de cordial amistad que por tan largo tiempo existieron entre las dos naciones."]

The Government of the Republic of Colombia in its own name and in the name of the Colombian people, accepts this declaration in the full assurance that every obstacle to the restoration of complete harmony between the two countries will thus disappear.

Article II. The Republic of Colombia shall enjoy the following rights in respect to the interoceanic canal and the Panama railway:

(1) The Republic of Colombia shall be at liberty at all times to transport through the interoceanic canal its troops, materials of war, and ships of war, even in case of war between Colombia and another country, without paying any charges to the United States.

(2) The products of the soil and industry of Colombia passing through the Canal, as well as the Colombian mails, shall be exempt from any charge or duty other than those to which the products and mails of the United States may be subject. The products of the soil and industry of Colombia, such as cattle, salt and provisions, shall be admitted to entry in the Canal Zone, and likewise in the islands and mainland occupied or which may be occupied by the United States as auxiliary and accessory thereto, without paying other duties or charges than those payable by similar products of the United States.

(3) Colombian citizens crossing the Canal Zone shall, upon production of proper proof of their nationality, be exempt from every toll, tax or duty to which citizens of the United States are not subject.

(4) During the construction of the interoceanic canal and afterward whenever traffic by the canal is interrupted, or whenever it shall be necessary for any other reason to use the railway, the troops, materials of war, products and mails of the Republic of Colombia, as above mentioned, shall, even in case of war between Colombia and another country, be transported on the railway between Ancon and Cristobal, or on any other railway substituted therefor, paying only the same charges and duties as are imposed upon the troops, materials of war, products and mails of the United States. The officers, agents and employees of the Government of Colombia shall, upon production of proper proof of their official character or their employment, also be entitled to passage on the said railway on the same terms

as officers, agents and employees of the Government of the United States. The provisions of this paragraph shall not, however, apply in case of war between Colombia and Panama.

(5) Coal, petroleum and sea salt, being the products of Colombia, passing from the Atlantic coast of Colombia to any Colombian port on the Pacific coast, and vice versa, shall be transported over the aforesaid railway free of any charge except the actual cost of handling and transportation, which shall not in any case exceed one-half of the ordinary freight charges levied upon similar products of the United States passing over the railway and in transit from one port to another of the United States.

Article III. The United States of America agrees to pay to the Republic of Colombia, within six months after the exchange of the ratifications of the present treaty, the sum of twenty-five million dollars, gold, United States money.

Article IV. The Republic of Colombia recognizes Panama as an independent nation and taking as a basis the Colombian law of June 9, 1855, agrees that the boundary shall be the following: From Cape Tiburon to the headwaters of the Rio de la Miel and following the mountain chain by the ridge of Gandi to the Sierra de Chugargun and that of Mali going down by the ridges of Nigue to the heights of Aspave, and from thence to a point on the Pacific half way between Cocalito and La Ardita.

In consideration of this recognition the Government of the United States will, immediately after the exchange of the ratifications of the present treaty, take the necessary steps in order to obtain from the Government of Panama the despatch of a duly accredited agent to negotiate and conclude with the Government of Colombia a treaty of peace and friendship, with a view to bring about both the establishment of regular diplomatic relations between Colombia and Panama and the adjustment of all questions of pecuniary liability as between the two countries, in accordance with recognized principles of law and precedents.

Article V. The present treaty shall be approved and ratified by the high contracting parties in conformity with their respective laws, and the ratifications thereof shall be exchanged in the city of Bogota as soon as may be possible.

In faith whereof the said plenipotentiaries have signed the present treaty in duplicate, and have hereunto affixed their respective seals.

Done at the city of Bogota, the sixth day of April, in the year of our Lord nineteen hundred and fourteen.

(L. S.) FRANCISCO JOSE URRUTIA.
(L. S.) MARCO FIDEL SUAREZ.
(L. S.) NICELAS ESGUERRA.
(L. S.) JOSE M. GONZALEZ VALENEIA.
(L. S.) RAFAEL URIBE URIBE.
(L. S.) ANTONIO JOSE URIBE.
(L. S.) THADDEUS AUSTIN THOMSON.

THE NAVAL MILITIA ACT.—The Senate on February 7 passed the Naval Militia bill, H. R. 8667, with amendments as indicated in the following text; bracketed words in Secs. 5 and 10 being matter stricken out by the Senate and italic text that inserted by the Senate. In all other particulars the bill is identically as passed by the House on December 10 last.

H. R. 8667.—To promote the efficiency of the Naval Militia and for other purposes.

Be it enacted, etc., That of the Organized Militia as provided for by law such part of the same as may be duly prescribed in each state, territory, and for the District of Columbia shall constitute a Naval Militia.

Sec. 2. That on and after three years from the date of the passage of this act the organization of the Naval Militia shall be units of convenient size, in each of which the number and ranks of officers and the distribution

of the total enlisted strength among the several ratings of petty officers and other enlisted men shall be established by the Secretary of the Navy, who shall also establish the number of officers and the number of petty officers and other enlisted men required for the organization of such units into larger bodies for administrative and other purposes, and the arms and equipment of the Naval Militia of the several states, territories, and the District of Columbia shall be the same as, or the equivalent of, that which is now or may hereafter be prescribed for the landing forces of the vessels of the United States Navy, and such other and additional arms, armament, and equipment, including vessels and stores, supplies, and equipment of all kinds for the repairing, maintenance, and operation of the same, as the Secretary of the Navy may from time to time prescribe for the training of the Naval Militia in duties afloat.

And the Secretary of the Navy is hereby authorized, in his discretion, to issue from time to time to the governors of the several states and territories and to the commanding general District of Columbia Militia, or to the other proper state, territorial and district authorities, respectively, as a loan, vessels and such stores, supplies, and equipment of all kinds as may be necessary for the maintenance and operation of said vessels, and may detail to said vessels such number of officers and enlisted men as he may deem desirable for duty as ship keepers: Provided, That such enlisted men shall be in addition to the number now or hereafter allowed by law for the regular Naval Establishment.

Sec. 3. That in the event of war, actual or threatened, with any foreign nation involving danger of invasion, or of rebellion against the authority of the Government of the United States, or whenever the President is, in his judgment, unable with the regular forces at his command to execute the laws of the Union, it shall be lawful for the President to call forth such number of the Naval Militia of a state or of the states, or territories, or of the District of Columbia, as he may deem necessary to repel such invasion, suppress such rebellion, or to enable him to execute such laws, and to issue his orders for that purpose, through the governor of the respective state or territory, or through the commanding officer of the Naval Militia of the District of Columbia, from which state, territory, or district such Naval Militia may be called, to such officers of the Naval Militia as he may think proper.

Sec. 4. That whenever the President calls forth all or any part of the Naval Militia of any state, territory, or of the District of Columbia, to be employed in the service of the United States, he may specify in his call the period for which such service is required, and the Naval Militia so called shall continue to serve during the term so specified, either within or without the territory of the United States, unless sooner relieved by order of the President: Provided, That if no period be stated in the call of the President, the period shall be held to mean the existence of the emergency, of which the President shall be the sole judge: And provided further, That no commissioned officer or enlisted man of the Naval Militia shall be held to service beyond the term of his existing commission or enlistment: Provided further, That when the military needs of the Federal Government, arising from the necessity to execute the laws of the Union, suppress insurrection, or repel invasion, cannot be met by the regular forces, the Naval Militia qualified as herein provided and any existing Naval Reserve now or hereafter organized shall be called into the service of the United States in advance of any volunteer naval force which it may then be determined to raise: And provided further, That nothing herein contained shall prevent the Secretary of the Navy, when vessels are purchased or otherwise acquired by the United States for a war, from manning such vessels by all or part of the officers and men then serving on said vessels.

Sec. 5. That every officer and enlisted man of the Naval Militia who shall be called forth in the manner hereinbefore prescribed shall be mustered for service without further [professional] appointment or enlistment, and

without further *professional* examination previous to such muster, except for those states and territories and the District of Columbia, if the case may so be, which have not adopted a standard of professional and physical examination prescribed by the Secretary of the Navy for the Naval Militia, and whose officers and petty officers shall not have been examined and found qualified in accordance therewith by boards of officers which shall be appointed by said Secretary: Provided, however, That any officer or enlisted man of the Naval Militia so qualified who shall refuse or neglect to present himself for such muster upon being called forth as herein prescribed, shall be subject to trial by court-martial and shall be punished as such court-martial may direct: Provided further, That when in the service of the United States, officers of the Naval Militia may serve on courts-martial for the trial of officers and men of the Regular or Naval Militia Service, but in the cases of courts-martial convened for the trial of officers of the Regular Service, the majority of the members shall be officers of the Regular Service; and officers and men of the Naval Militia may be tried by courts-martial the members of which are officers of the Regular or Naval Militia Service, or both:

And provided further [That when vessels in the service of the United States, commanded by Naval Militia officers, co-operate or act in conjunction with vessels commanded by officers of the navy, the exercise of command over such combined force shall be determined by the rank which such commanding officers hold, except that, for the purposes of this proviso, Naval Militia captains, commanders, and lieutenant commanders shall be junior to lieutenant commanders of the navy, unless specially certified for a higher grade by examination held under the authority of the Secretary of the Navy.]

That Naval Militia officers mustered as such into the service of the United States under the provisions of this act shall rank with but after officers of the Regular Navy in the same grade and rank; except that for the purpose of determining who shall exercise command over a combined force, composed of vessels commanded by Naval Militia officers and of vessels commanded by officers of the navy acting in conjunction, all officers of the Naval Militia of or above the rank of lieutenant commander will be regarded as junior to lieutenant commanders of the navy.

Sec. 6. That the Naval Militia, when called into the service of the United States, shall be governed by the Navy Regulations and the articles for the government of the navy.

Sec. 7. That the Naval Militia, when called into the service of the United States, shall, during their time of service be entitled to the same pay and allowances as are or may be provided by law for the Regular Navy.

Sec. 8. That when the Naval Militia is called into the service of the United States, or any portion of the Naval Militia is called forth under the provisions of this act, their pay shall commence from the day of their reporting in obedience to such call at their local ship, armory, or quarters; but this provision shall not be construed to authorize any species of expenditure previous to arriving at such places which is not provided by existing laws to be paid after their arrival at such places.

Sec. 9. That the adjutant general of each state, territory, or the District of Columbia, or such other person, board, or bureau as may be provided by the laws of such state, territory, or the District of Columbia to perform for the Naval Militia the duties ordinarily performed by such adjutant general, shall make returns to the Secretary of the Navy, at such times and in such form as the Secretary of the Navy shall from time to time prescribe, of the strength of the Naval Militia, and also make such reports as may from time to time be required by the Secretary of the Navy. That the Secretary of the Navy shall, with his annual report of each year, transmit to Congress an abstract of the returns and reports of the adjutants general, or of such person, board, or bureau of the state, territories, and the District of Columbia, with such observations thereon as he may deem necessary for the information of Congress.

Sec. 10. That the Secretary of the Navy is hereby authorized to procure, by purchase or manufacture, and issue from time to time to the Naval Militia such number of United States service or other arms, accessories, accouterments, equipment, uniforms, clothing, equipage, and military and naval stores of all kinds, under such regulations as he may prescribe, as are necessary to arm, uniform, and equip all of the Naval Militia in the several states, territories, and the District of Columbia in accordance with the requirements of this act without charging the cost or value thereof or any expense connected therewith against the allotment of such state, territory, or district made from the annual appropriation provided for the arming and equipping of the Naval Militia in the annual appropriation for the navy, or in any other general appropriation for the Naval Militia that may hereafter be made [nor] *or without* requiring payment therefor, and to issue from time to time ammunition suitable for such arms as the Naval Militia of the several states, territories, and the District of Columbia may be equipped with, and to exchange said arms, accessories, accouterments, equipment, equipage, stores, and ammunition when the same shall have become obsolete, without receiving any money credit therefor, for other arms, accessories, accouterments, equipment, equipage, stores, and ammunition suitable for the Naval Militia: Provided, That said property shall remain the property of the United States [except as hereinafter provided], and be annually accounted for by the governor or other proper officer of the states, territories, and the commanding general District of Columbia Militia: Provided further, That each state, territory, and the District of Columbia shall, when and as required by the Secretary of the Navy, turn in to the Navy Department, or otherwise dispose of, in accordance with the direction of the Secretary of the Navy, without receiving any money credit therefor, and without expense for transportation or otherwise, such or all property theretofore issued under the provisions of this act. To provide means to carry into effect the provisions of this section, the necessary money to cover the cost of procuring, exchanging, or issuing of arms, accessories, accouterments, equipment, uniforms, clothing, equipage, ammunition, and military and naval stores to be exchanged or issued hereunder is hereby appropriated out of any money in the treasury not otherwise appropriated: Provided, That the sum expended in the execution of the purchases and issues provided for in this section shall not exceed the sum of $200,000 in any fiscal year: And provided further, That the Secretary of the Navy shall annually submit to Congress a report of expenditures made by him in the execution of the requirements of this section.

Sec. 11. That when it shall appear by the report of inspections, which it shall be the duty of the Secretary of the Navy to cause to be made at least once in each year by officers detailed by him for that purpose, that the Naval Militia of a state, or territory, or of the District of Columbia is sufficiently armed, uniformed, and equipped for active duty, the Secretary of the Navy is authorized, in his discretion, on the requisition of the governor of such state or territory or of the commanding general District of Columbia Militia, to pay to such officer as may be properly designated and appointed by said governor or commanding general so much of its allotment from the annual appropriation for arming and equipping the Naval Militia in the annual appropriation for the navy as shall be necessary for the payment, subsistence, and transportation of such portion of said Naval Militia as shall engage in actual service or instruction afloat or on shore; and the officers and men of such Naval Militia while so engaged may be paid therefrom the same pay, subsistence, and transportation or travel allowance as officers and men of the corresponding grades of the Regular Navy are or may hereafter be entitled to by law, and the officer so designated and appointed shall be regarded as a disbursing officer of the United States and shall render his accounts through the Navy Department to the proper accounting officer of the treasury for settlement, and he shall be required to give good and sufficient bonds to the United States, in such sums as the

Secretary of the Navy may direct, faithfully to account for the safe-keeping and payment of the public moneys so intrusted to him for disbursement.

Sec. 12. That the Secretary of the Navy is authorized, in his discretion, to provide for participation by any part of the Naval Militia of any state or territory or the District of Columbia on the request of the governor of said state or territory or the commanding general of the Militia of said District, in any cruise, maneuvers, field instruction, or encampment of any part of the Regular Navy, afloat or on shore. In such case the Naval Militia so participating shall, if so requested by the governor or commanding general and allowed by the Secretary of the Navy, receive the same pay, subsistence, and transportation as is provided by law for the officers and men of the Regular Navy, and no part of the sums appropriated for the support of the Regular Navy shall be used to pay any part of the expenses of the Naval Militia of any state, territory, or the District of Columbia while engaged in such cruise, maneuvers, field instruction, or joint encampment of the Regular Navy and Naval Militia, but no payments to the Naval Militia under the provisions of this section and no allowances for mileage shall be made from appropriations made for the navy, but shall be made solely from the sums appropriated for such cruise, maneuvers, field instruction, or for the Naval Militia: Provided, That officers of the Regular Navy in command of vessels upon which Naval Militia may be embarked, or in command of camps, navy yards, or other places in which Naval Militia may be encamped or be, shall remain in command of said vessels, camps, navy yards, or other places, as aforesaid, irrespective of the rank of the commanding or other officers of the Naval Militia, on board said vessels or within said places: Provided further, That said commanding officers of the Regular Navy may, in the exercise of their discretion, place upon any duty to which his rank or rating would entitle him if he were of the same rank or rating in the Regular Navy, or duty of a lower grade, any officer, petty officer, or enlisted man of the Naval Militia so under his command as aforesaid, and may temporarily or permanently relieve from duty so imposed such officer, petty officer, or enlisted man; and in making details to command and duty, and relieving from command and duty as aforesaid, said commanding officer shall be held to the exercise of a reasonable discretion only, and for toe purposes of this section it is to be presumed that a member of the Naval Militia is competent to be detailed for any duty to which his rank would entitle him until the contrary be apparent to such commanding officer: And provided further, That any officer or petty officer or enlisted man of the Naval Militia placed on duty as aforesaid or detailed to duty on a vessel assigned to the Naval Militia shall have, during the time that he is on duty, all authority over all persons inferior to himself in rank or equivalent rank necessary for the purpose of carrying out the duty upon which he has been so detailed.

Sec. 13. That whenever any officer or enlisted man of the Naval Militia shall, upon the recommendation of the governor of any state, territory, or the commanding officer of the District of Columbia Naval Militia, and when authorized by the Secretary of the Navy, attend and pursue a regular course of study at any military or naval school or college of the United States or on board ship, such officer or enlisted man shall receive from the annual appropriation for the support of the navy the same travel allowances and quarters or commutation of quarters to which an officer or enlisted man of the Regular Navy would be entitled for attending such school or college or doing duty on such ship under orders from proper authority. Such officers shall also receive commutation of subsistence at the rate of $1 per day and each enlisted man such subsistence as is furnished to an enlisted man of the Regular Navy while in actual attendance upon a course of instruction.

Sec. 14. That the annual appropriation made by Congress for arming and equipping the Naval Militia in the annual appropriation for the navy shall be available for the purpose of providing for issue to the Naval Militia any stores and supplies or publications which are supplied to the navy by any department. Any state, territory, or the District of Columbia

may, with the approval of the Secretary of the Navy, purchase for cash from the Navy Department, for the use of its Naval Militia, stores, supplies, material of war, or military publications, such as are furnished to the navy in addition to those issued under the provisions of this act, at the price at which they are listed for issue to the navy, with the cost of transportation added, and funds received from such sales shall be credited to the appropriation to which they belong and shall not be covered into the treasury, but shall be available until expended to replace therewith the supplies sold to the states and territories and to the District of Columbia in the manner herein provided.

Sec. 15. That each state or territory or the District of Columbia furnished with material of war under the provisions of this or former acts of Congress shall, during the year next preceding each annual allotment of funds, in order to participate in such annual allotment of funds, have required every ship's company, engineer's, navigator's, and other divisions or units, of its Naval Militia not excused by the governor of said state or territory, or the commanding general District of Columbia Militia, for reasons satisfactory to the Secretary of the Navy, to participate during at least five consecutive days in such form of military or naval exercise as may have been prescribed by the Secretary of the Navy, and in default of such prescribing by the Secretary of the Navy, then in some form of Naval Militia exercise during at least five consecutive days to be prescribed by the governor of the said state or territory, or the commanding officer of the District of Columbia Naval Militia, and shall also have required said divisions to assemble for drill and instruction at armories or other places of rendezvous or for target practice not less than twenty-four times, and shall have required during each year an inspection of each of said divisions or units, to be made by an officer of said Naval Militia, or by an officer of the state service, or by an officer of the Regular Navy.

Sec. 16. That the Secretary of the Navy is hereby authorized and empowered, upon the request of the governor of any state or territory, or of the commanding general District of Columbia Militia, having an organized Naval Militia, to detail an officer or officers to inspect, instruct, and examine such Naval Militia at such times and places as may be appointed by any of said governors or commanding general, and may, upon his own motion, also detail officers for the purpose of formulating standard regulations for the organization, discipline, training, armament, and equipment of said Naval Militia, and for the professional examination of the officers, petty officers, and men composing the same, with a view to producing uniformity among the Naval Militia of the various states and assimilating them to the standard of the U. S. Navy.

Sec. 17. That upon the application of the governor of any state or territory, or of the commanding general District of Columbia Militia, furnished with material of war under the provisions of this act or former laws of Congress, the Secretary of the Navy may, in his discretion, detail one or more officers or enlisted men of the navy to report to the governor of such state or territory, or to the commanding general of the District of Columbia Militia, for duty in connection with the Naval Militia. All such assignments may be revoked at the request of the governor of such state or territory, the commanding general of the District of Columbia Militia, or at the pleasure of the Secretary of the Navy. The Secretary of the Navy is hereby authorized to appoint a board of five officers of the Naval Militia, which shall from time to time, as the Secretary of the Navy may direct, proceed to Washington, D. C., for consultation with the Navy Department respecting the condition, status, and needs of the whole body of the Naval Militia. Such officers shall be appointed for a term of four years, unless sooner relieved by the Secretary of the Navy.

The actual and necessary traveling expenses of the members of such board, together with a per diem to be established by the Secretary of the Navy, shall be paid to the members of the board. The expenses herein

authorized, together with the necessary clerical and office expenses of the division of Naval Militia affairs in the office of the Secretary of the Navy, shall constitute a charge against the whole sum annually appropriated under the appropriation for the arming and equipping of the Naval Militia in the annual appropriation for the navy, and shall be paid therefrom, and not from the allotment duly apportioned to any particular state, territory, or the District of Columbia; and a statement of such expenses shall be submitted to Congress by the Secretary of the Navy in connection with his annual report.

Sec. 18. That the Naval Militia embarked upon any vessel of the navy, or other vessel, or encamped at any military post or camp of the United States, may be furnished such amounts of ammunition for instruction in firing and target practice as may be prescribed by the Secretary of the Navy, and such instruction in firing shall be carried on under the direction of an officer selected for that purpose by the Secretary of the Navy.

Sec. 19. That when any officer, petty officer, or enlisted man of the Naval Militia is disabled by reason of wounds or disabilities received or incurred in the naval service of the United States in time of war he shall be entitled to all the benefits of the pension laws existing at the time of his service, and in case such officer, petty officer, or enlisted man dies in the naval service of the United States in time of war, or in returning to his place of residence after being mustered out of such naval service, or at any time in consequence of wounds or disabilities received in such naval service in time of war, his widow and children, if any, shall be entitled to all the benefits of such pension laws.

Sec. 20. That all expenditures authorized to be paid by the Secretary of the Navy under the provisions of this act shall be paid out of the $200,000 appropriated in Sec. 10 of this act, except such additional expenditures as may be authorized by the annual naval appropriation act.

Sec. 21. That, for the purpose of securing a list of persons especially qualified to hold commissions in the navy or in any reserve or volunteer naval force which may hereafter be called for and organized under the authority of Congress, other than a force composed of Organized Naval Militia, the Secretary of the Navy is authorized from time to time to convene examining boards at suitable and convenient places in different parts of the United States, who shall examine as to their qualifications for naval duties all applicants who shall have served in the Regular Navy of the United States or in the Organized Naval Militia of any state or territory or the District of Columbia. Such examination shall be under rules and regulations prescribed by the Secretary of the Navy. The record of previous service of the applicant shall be considered as part of the examination. Those applicants who pass such examinations shall be certified as to their fitness for naval duties and rank, and shall, subject to a physical examination at any time, constitute an eligible class for commissions, pursuant to such certification, in any volunteer naval force hereafter called for and organized under the authority of Congress other than a force composed of Organized Naval Militia; and the President is hereby further authorized, upon the outbreak of war, or when, in his opinion, war is imminent, to commission in the Regular Navy for the exigency of such war such of the persons whose names have been certified as above provided as he may select: Provided, That no one shall be commissioned to a higher rank than the rank for which he may have been recommended by said examining board: And provided further, That the President may also commission or warrant as of the highest rank formerly held by him, or the present equivalent of such former rank in case the nomenclature or some of the specific duties of the same may have been changed, any person who having been formerly a commissioned or warrant officer of the U. S. Navy shall have been honorably discharged from the service: And provided further, That persons may be commissioned in the navy for engineer duties only, and for all line duties

other than engineer duties, when so commissioned shall have the full rank, pay, precedence, etc., of the line grade for which they are commissioned.

Sec. 22. That all laws and sections of laws conflicting with the provisions of this act are hereby repealed.

—*Army and Navy Journal.*

THE NAVAL MILITIA.—Under the terms of the Naval Militia law the Militia is given until February 16, 1917, to prepare to comply with the organization prescribed by the Secretary of the Navy. After that date the Secretary shall prescribe the arms, armament and equipment of the Naval Militia, and he is authorized to issue to the governors of the states as a loan vessels, stores, supplies and equipment for the Naval Militia. The law in many respects is stronger than the Dick law, under which the Organized Militia is operating. Its chief features are as follows:

1. The President is authorized in event of war, actual or threatened, invasion or rebellion to call upon the Naval Militia to repel such invasion, suppress such rebellion or to execute his orders; the orders to be issued through the governor of the state.

2. The officers and men shall be mustered for service without further appointment or enlistment.

3. The Naval Militia, when called into service, shall be governed by the navy regulations.

4. In time of service officers and men shall receive the same pay as the same grades in the regular service.

5. The Secretary of the Navy is authorized to purchase or manufacture arms, accessories, equipment, uniforms, clothing, etc., and furnish to the Naval Militia of the various states; this material to be returned to the Navy Department when required; $200,000 was appropriated for this purpose by the present bill.

6. The Secretary may have the Naval Militia participate in cruises, maneuvers, etc., of the Regular Navy at his discretion, in which case they get the same pay and allowances as the Regular Navy for the cruise.

7. Each state Naval Militia shall have at least five days of military or naval exercise each year.

8. Officers of the regular service shall be detailed to inspect the Naval Militia of the various states at such times as may be appointed by the governors.

9. A Naval Militia board of five officers shall visit Washington from time to time to consult with the Navy Department respecting the condition, status and needs of the Naval Militia.

10. Ammunition for target practice shall be furnished at the discretion of the Secretary of the Navy, the firing to be done under the direction of an officer detailed by the Secretary.

11. An examining board shall hold examinations from time to time under rules prescribed by the Secretary. Commissions and certificates will be given to officers and men who qualify.

In a speech at the banquet of the Naval Militia at the New Willard Hotel, Washington, D. C., March 16, 1914, Hon. Josephus Daniels made a speech, in the course of which he said:

"At the time of the outbreak of the Spanish-American War the Naval Militia force of the United States consisted of 4445 officers and men, and the training that they had was of immense advantage to us in that hour of need. During that war about 4000 officers and men were added to the navy by enlistments from the Naval Militia. Eight hundred and fifty-six volunteer officers served in the navy during the Spanish-American War, and a very large proportion of these came out of the Naval Militia of the states, and not enough can be said of the zeal and attention to duty which this branch of the service showed in that war. Most efficient and thorough service was rendered by this Naval Militia in our last war in the auxiliary naval forces, the coast signal service and on the cruising ships, of which the

Yankee, Dixie, Prairie and *Yosemite* were entirely officered and manned by them, with the exception of the commanding, executive and navigating officers. The experience of this war demonstrated the necessity of a national reserve force to be subject to the call of the Government in time of war, and since then the Naval Militia has steadily increased in strength and efficiency, and additional and more up-to-date equipment has been loaned by the Government for their instruction and training, until to-day there are 621 officers and 7196 petty officers and men, making a grand total of 7817, in the Naval Militia forces of our country, representing 22 states and the District of Columbia, and there are now assigned to them 32 vessels of the navy of various types, besides additional small boats and other necessary equipment.

"I know from personal experience, although I have been in the Secretary's office for but little over a year, of the great enthusiasm of the men in this service, and it has been a matter of keen regret to me that it has often been difficult to give them vessels of sufficient equipment and size to correspond to the zeal and enthusiasm of the men who would man them. The cruises made by these organizations and the practice which they have had on board have been of infinite value, and I am convinced that in the Naval Militia this great Government of ours has an asset which it cannot afford to neglect. They have already proved that in time of war they make a most efficient and valuable fighting force, even though their training has been obtained by snatches and during the vacations which these men have had from their business duties."

Referring to the Naval Militia Act, of which a synopsis is here given, Mr. Daniels said: "I am in a position to say that the navy is intensely interested in this arm of the service; that the men of the navy realize what it means in time of sudden crisis to be able to call upon a large body of men who have been already trained in coast defence and in cruising and target practice—men who would be able to render quick service and to fill up the gaps of men who might be detailed to distant points or lost in battle. In view of the fact, then, that there exists on the part of the navy this keen desire to do everything possible to bring to the point of highest efficiency the Naval Militia, I trust that the people of the various states which border on or are contiguous to the coast, and especially the officials of these states, shall continue to show the zeal and forwardness which they have in the past to render aid to their country through the navy in time of stress.

"The other point which I would like to emphasize is the need of effective drilling. I do not think that any other nation has surpassed—if it has even reached—the efficiency of the U. S. Navy in target practice. Officers and men on every ship we have have vied with each other to excel in shooting the mark. I hope to see much activity of drill and practice on board men-of-war on the part of the Naval Militia forces, and it is the intention of the Navy Department to have the Naval Militia go on board the battleships whenever it is possible to arrange it."

NAVAL ACADEMY GRADUATES' ASSOCIATION

The present unsettled condition in Mexico, calling for the detachment to Southern waters of a large proportion of the fleet, will interfere to some extent with the possible attendance at the Alumni dinner on June 4th. However, the Secretary has already (May 2) received acceptances from 156, with prospects of quite a number more coming.

The reunion of '68 promises to be quite a success. They will be the guests of Col. Thompson in Washington on the evening of June 3 at a class dinner, to which have been invited the living members of the corps of instructors who were associated with that class at the Academy.

McKay of '84; Tompkin and McLean of '94 and Wilkinson of '04 are working on their respective classes. Of course a large percentage of '94 and '04 are at sea and of necessity will be unable to attend, but as large a number as can will answer present at the roll-call.

The subscription to the dinner is $5.00 and should be mailed to the Secretary-Treasurer.

It may prove of interest to the Naval Academy Alumni to learn that, while we are arranging for our twenty-ninth reunion, West Point has started a movement for their first regular annual reunion. For years it has been the custom for classes to gather there as classes, but up to this year no definite move has been made for a general reunion of the alumni as a body. They, too, have taken up the idea of class reunions every five years from date of graduation.

Ninety-two's twentieth reunion in 1912 marked the birth of "The Bulletin Board," a pamphlet published in the interest of the class of '92, and issued from time to time. Its primary purpose, as I take it, is to keep the members of the class, both in and out of the service, in touch with one another. Its actual effect has been much broader, for it has not only bound the class ties more strongly, but has brought the class, individually, and as a whole, in closer touch with their Alma Mater. Those classes who may be in-

terested, and who believe in the injunction: "Go thou and do likewise," are respectfully referred to Comdr. C. T. Jewell, 2135 R St., N. W., Washington, D. C., who, I know, will cheerfully give any and all information.

The Farragut Memorial Window Committee, at the meeting in Washington, on March 10, had before them a number of designs submitted by several competitors. No decision was reached by the committee in the matter of choosing one out of the number, the committee concluding to place all of the designs before the Commission of Fine Arts, that they might pass opinion upon them all. There will be another committee meeting on May 8.

The office of the Graduates' Association will be transferred to the Officers' Mess Building for June 4, and the Secretary will be found there at any time after ten in the morning.

Two of the graduates about whom information was requested are dead. The present addresses of a number of others, whose whereabouts, heretofore, have been unknown, are given below.

Name	Class	Address
Wood, George W.....	'61	Fort Norfolk, Atlantic City Ward, Norfolk, Va.
D'Orleans, Pierre	'63	duc de Penthiere, 112 Boulevard de Haussmann, Paris.
Paine, Frederick H. ...	'67	10 Catherine St., Newport, R. I.
Bean, John W.....	'73	*Died . . . . 1892.*
O'Halloran, Thomas M.	'87	*Died . . . . McKee's Rocks, Pa.*
Stafford, Leroy A.	'88	Alexandria, La.
Buck, William H.	'90	Care of 1st Nat. Bank, Mobile, Ala.
Marble, Ralph N., Jr....	'98	Care of Mahoning Oil & Steel Co., Hibbing, Minn.
Hayes, William P.	'60	Consolidated Gas Co., 130 E. 15th St., New York City.
Harter, Robert L.	'06	Winfield, Kansas.
Nixon, Warren C.	'07	905 Syndicate Trust Bldg., St. Louis, Mo.
Burford, Robert A. ...	'07	Power Equipment Co., 131 State St., Boston, Mass.
Howell, James B.....	'07	2870 Washington St., San Francisco, Cal.
Howard, David S. H...	'07	Care of Chas. Millar & Son Co., Utica, N. Y.
Gillmor, Reginald E....	'07	Sperry Gyro Co., 57 Victoria St., London, S. W., Eng.
Dallas, George M.....	'07	2320 West End Ave., Nashville, Tenn.
Leonard, Emeric R.....	'07	Benedict Apt., Washington, D. C.
McNeill, Andrew B....	'08	Bragonia, Tex.
Stoer, Charles H.....	'08	4615 N. Broad St., Phila., Pa.
Van De Boe, Hugh R...	'09	416 Garfield Bldg., Cleveland, Ohio.

Name	Class	Address
Butler, William P.....	'09	Ass't Highway Engi., Salem, Oregon.
Yost, Charles S.....	'09	Care of San Diego & Arizona Ry. Co., San Diego, Cal.
Allewelt, Robert L.....	'09	Gen. Elec. Co., Schenectady, N. Y.
Henderson, Monroe I..	'09	P. O. Box 1092, Dallas, Tex.
Vetter, William P.....	'09	519 Forest St., Oakland, Cal.
Osmun, Russell A.....	'10	Coast Art. Corps, U. S. Army.
Mitchell, Stanley	'11	Tusculum College, Greenville, Tenn.
Mayfield, Paul C.....	'11	2322 N. Park Ave., Phila., Pa.
Woodward, Kenneth C.	'11	320 Wayland Ave., Providence, R. I.
Brown, Martin L.....	'11	53 Market St., Bethlehem, Pa.
Hoddick, Frederick G..	'11	Y. M. C. A. Bldg., Federal St., Camden, N. J.
Waddell, William C....	'12	1610 Williamson Bldg., Cleveland, O.
Sleeper, Paul de Voe..	'13	225 33d St., Newport News, Va.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its forty-first year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The PROCEEDINGS are published every two months and anyone may subscribe for them. The annual subscription is $3.00; single copies, 50 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1915

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1915. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

B. C. ALLEN,
Lieut. Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

"A Personnel Reserve for the Naval Service."

"Value of Speed as an Offensive Element in Battleship Strategy and Tactics, as Compared with Armor."

LIST OF PRIZE ESSAYS

1879

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut.-Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut.-Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. Navy.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieutenant Commander Dudley W. Knox, U. S. Navy.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. Navy.

THE BATTLE OF THE PEIHO FORTS, JUNE 25, 1859